BIHAR AGRICULTURAL UNIVERSIT, SABOUR, BHAGALPUR

TEACHING MANUAL

Title of course: Livestock & Poultry Management

Course No: AAG 112 Credit: 4(3+1)

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INDEX

Chapter 1.

ROLE OF LIVESTOCK IN INATIONAL ECONOMY

Animal husbandry is an integral component of Indian agriculture supporting livelihood of more than two-thirds of the rural population. Animals provide nutrient-rich food products, draught power, dung as organic manure and domestic fuel, hides & skin, and are a regular source of cash income for rural households. They are a natural capital, which can be easily reproduced to act as a living bank with offspring as interest, and an insurance against income shocks of crop failure and natural calamities. India's livestock sector is one of the largest in the world. It has 56.7% of world's buffaloes, 12.5% cattle, 20.4% small ruminants, 2.4% camel, 1.4% equine, 1.5% pigs and 3.1% poultry. In 2010-11 livestock generated outputs worth Rs 2075 billion (at 2004-05 prices) which comprised 4% of the GDP and 26% of the agricultural GDP. The total output worth was higher than the value of food grains. Despite significant increases in livestock production, per capita consumption of milk (69 kg) and meat (3.7 kg) in 2007 has been much lower against corresponding world averages of 85 and 40 kg.

By the end of 12th Plan demand, for milk is expected to increase to 141 million tons and for meat, eggs and fish together to15.8 million tons. Global market for animal products is expanding fast, and is an opportunity for India to improve its participation in global market.

Livestock sector grew at an annual rate of 5.3% during 1980s, 3.9% during 1990s and 3.6% during 2000s. Despite deceleration, growth in livestock sector remained about 1.5 times larger than in the crop sector which implies its critical role in cushioning agricultural growth.

Distribution of livestock is more equitable than that of land. Livestock has been an important source of livelihood for small farmers. They contribute about 16% to their income, more so in states like Gujarat (24.4%), Haryana (24.2%), Punjab (20.2%) and Bihar (18.7%).

The agricultural sector engages about 57% of the total working population and about 73% of the rural labour force. Livestock employed 8.8% of the agricultural work force albeit it varied widely from 3% in North-Eastern states to 40-48% in Punjab and Haryana.

Animal husbandry promotes gender equity. More than three-fourth of the labour demand in livestock production is met by women. The share of women employment in livestock sector is around 90% in Punjab and Haryana where dairying is a prominent activity and animals are stallfed.

The distribution patterns of income and employment show that small farm households hold more opportunities in livestock production. The growth in livestock sector is demand-driven, inclusive and pro-poor. Incidence of rural poverty is less in states like Punjab, Haryana, Jammu & Kashmir, Himachal Pradesh, Kerala, Gujarat, and Rajasthan where livestock accounts for a sizeable share of agricultural income as well as employment. Empirical evidence from India as well as from many other developing countries suggests that livestock development has been an important route for the poor households to escape poverty. World trade in milk is limited; only 6 per cent of world milk production is traded the world over. The perishable and bulky nature of milk is often cited as the prime reason for a limited trade in milk.

1. Importance of livestock in rural economy

Animal husbandry, dairying and fisheries activities play an important role in national economy and in socio-economic development of the country. These activities have contributed to the food basket, nutrition security, and household income of the farmers and play a significant role in generating gainful employment in the rural areas, particularly among the landless, small and marginal farmers and women, besides providing cheap and nutritious food. Livestock are the best insurance for farmers against vagaries of nature like drought and other natural calamities.

1. **Livestock** –integral part of the agricultural production system of India. India is endowed with the largest livestock population in the world. It accounts for about 57.3 per cent of the world's buffalo population and 14.7 per cent of the cattle population.
2. **Employment generation:** Total number of workers in farming of animals is 20.5 million. The agricultural sector engages about 57% of the total working population and about 73% of the rural labour forces.
3. **Women empowerment**: Animal husbandry promotes gender equity and more than three-fourth of the labour demand in livestock production is met by women.
4. **Nutritional security:** India continues to be largest producer of milk in world with 127.9 million ton and it contributes 13.1% of total milk produced in the world. Per capita availability of milk in India 283 gm while the world average is 285 gm but ICMR recommendation is 300gm.The egg production of India is around 66.45 billion 2011-12. The per capita availability of eggs is around 55 per year.
5. **Regular source of income generation:** Around 16% of farmer's income is generated through sale of livestock and livestock products. It accounts for about 57.3 per cent of the world's buffalo population, 14.7 per cent of the cattle population and 20.4% small ruminants.In 2010-11 livestock generated outputs which comprised 5.26% of the GDP and 26% of the agricultural GDP
6. **Source of power** in agricultural operation (draft power) ploughing, threshing, water harvesting, transportation etc.
7. **Supply of organic fertilizer to improve Soil fertility**- manure dung, urine, leftover feed and fodder
8. **Utilization of crop residue and non-edible nutrients** as a source of animal feed
9. Gobar gas plant for production of energy
10. Medicinal purposes i.e., serum, tetanus toxoid vaccine
11. Slaughter house byproducts are useful for preparation of Quality animal protein.
12. **Insurance against crop failure**: acts as a Dependable ""Bank on hooves" at the time of need.

19TH LIVESTOCK CENSUS-2012— (In Millions)													
States/UTs	Cattle	Buffaloes	Sheep	Goats	Pigs	Horses & ponies	Mules	Donkey	Camel	Yaks	Mith-un	**Total Live-stock**	Total Poultry

Bihar	**12.232**	**7.57**	**0.232**	**12.15**	**0.650**	**0.049**	**0.025**	**0.021**	**0.009**	**0**	**0**	**32.94**	**12.74**
India	190.90	108.70	65.07	135.17	10.29	0.62	0.196	0.319	0.40	0.077	0.298	512.057	729.209
18th LIVESTOCK CENSUS-2007— (In Millions)													
Bihar	12.55	6.7	0.22	10.2	0.63	0.05	0	0.024	0	-	**-**	30.34	11.42
India	199.07	105.34	71.55	140.53	11.13	0.61	0.14	0.44	0.52	0.08	**-**	529.69	648.83
Growth	-2.61	13.11	6.52	19.54	-4.04	-	-	-	-	-	**-**	8.56	11.63

Production of Major Livestock Products – All India

YEAR	Milk (Mill. Tonnes)	Eggs (Billion Nos.)	Wool (Million Kgs.)	Meat (Million Tonnes)
2011-12	127.9	66.45	44.73	5.5

1. **Milk Production:**

India, the largest producer of milk in the world, is set to produce over 133 million tonne milk during2012-13. Several measures have been initiated by the Government to increase the productivity of milch animals, which has resulted in increasing the milk production significantly from the level of 102.6 million tonnes at the end of the Tenth Plan (2006- 07) to 127.9 million tonnes at the end of the Eleventh Plan (2011-12). The Annual growth rate for production of milk is about 5% in 2011-12 compared to 2010-11.

2. **Egg Production:**

Poultry development in the country has shown steady progress over the years. Currently egg production is around 66.45 billion in 2011-12 which is about 5% over the previous year production of about 63.02 billion eggs. The poultry meat production is estimated to be about 2.47 million tonnes. The current per capita availability of eggs is around 55 eggs per year. Exports of poultry products are currently at around `457.82 crore in 2011-12 as per the report of Agricultural and Processed Food Products Export Development Authority APEDA).

3. **Wool Production:** Wool production declined marginally at the end of Eleventh Five Year Plan (2011-12) to 44.7 million kg. from 45.1 million kg.in the Tenth Five Year Plan (2006-07). The Annual growth rate for production of wool is about 4% in 2011-12 compared to previous year.

4. Meat Production: The meat production has registered a healthy growth from 2.3 million tonnes at the end of Tenth Five Year Plan (2006-07) to 5.5 million tonnes at the end of the Eleventh Five Year Plan (2011-12). The Annual growth rate for meat production in 2011-12 was about 13%

5. Fisheries Production:

The Country has vast potential for fisheries in view of our long coastline of about 8,000 kms apart from the inland water resources. As per the estimates of CSO, the value of output from fisheries sector at current price was about 76,699 crore during 2011-12 which is about 4.15% of the value of agricultural and allied sector output at current price. India is the second largest producer of fish and the second largest producer of fresh water fish in the world. Fish production has increased from 41.57 lakh tonnes (24.47 lakh tonnes for marine and 17.10 lakh tonnes for inland fisheries) in 1991-92 to 86.66 lakh tonnes (33.71 lakh tonnes for marine and 52.95 lakh tones for inland fisheries) in 2011-12. While the inland fisheries production has registered a robust growth during this period, the growth in marine fisheries has been slower.

6. Export of livestock and fisheries products:

The Livestock sector also contributes to export in spite of the fact limited number of livestock enterprises function in the country on commercial basis. Total export earnings from livestock, poultry and related products were 33,417 crore during 2011-12 as compared to 25,409 crore during previous year i.e. 2010-11 with a growth of about 31.5%. Total export earnings from fisheries products have also shown steady increase and reached to 16,597.23 crore during 2011-12 compared to 12,901.47 crore during 2010-11 with a growth of about 28.65%.

Challenges before Animal Husbandry

1. Improving productivity in a huge population of low-producing animals is one of the major challenges. The average annual milk yield of Indian cattle is 1172 kg which is only about 50% of the global average and much less than in New Zealand (3343 kg), Australia (5600 kg), UK (7101 kg), US (9332 kg) and Israel (10214 kg). Likewise the meat yield of most species is 20-60% lower than the world average.
2. The growth in milk production decelerated from 4.4% during 1990s to 3.9% during 2000s. There remains a huge gap between the potential and the realized yields in Indian livestock. Only 27-75% of the dairy animal potential yield is realized in different regions of the country because of constraints related to feeding, breeding, health and management. Output worth of Rs. 283 billion (at 2003 prices), which was equivalent to 25% of the value of milk produced in 2002, was lost due to these constraints.
3. Feed and fodder scarcity is identified as the most limiting constraint accounting for half of the total loss, followed by problems in breeding and reproduction (21%) and in health (18%).
4. Cross breeding of indigenous species with exotic stocks to enhance genetic potential of different species has been successful only to a limited extent.
5. Limited AI services owing to deficiency in quality germplasm, infrastructure and technical manpower coupled with poor conception rate following artificial insemination have been the major impediments. After more than three decades of crossbreeding, the crossbred population is only 16.6% in cattle, 21.5% in pigs and 5.2% in sheep.
6. Livestock derive major part of their energy requirement from agricultural by products and residues. Hardly 5% of the cropped area is utilized to grow fodder. India is deficit in dry fodder by 11%, green fodder by 35% and concentrates feed by 28%. The common grazing lands too have been deteriorating quantitatively and qualitatively.
7. Frequent outbreaks of diseases like FMD, BQ, PPR, Influenza etc. continue to affect livestock health and productivity. India has about 55000 veterinary

institutions including poly clinics, hospitals, dispensaries and stockman centres. Veterinary and animal health services are largely in the public sector domain and remain poor.

8. India's huge population of ruminants remains a major source of greenhouse gases adding to global warming. Reducing greenhouse gases through mitigation and adaptation strategies will be a major challenge.
9. The sector will also come under significant adjustment pressure to the emerging market forces. Though globalization will create avenues for increased participation in international trade, stringent food safety and quality norms would be required.
10. Livestock sector did not receive the policy and financial attention it deserved. The sector received only about 12% of the total public expenditure on agriculture and allied sectors, which is disproportionately lesser than its contribution to agricultural GDP. The sector too has been neglected by the financial institutions. The share of livestock in the total agricultural credit has hardly ever exceeded 4% in the total (short-term, medium-term and long-term). The institutional mechanisms to protect animals against risk are not strong enough. Livestock extension has remained grossly neglected in the past. Only about 5% of the farm households in India access information on livestock technology. These indicate an apathetic outreach of the financial and information delivery systems.
11. Access to markets is critical to speed up commercialization of livestock production. Lack of access to markets may act as a disincentive to farmers to adopt improved technologies and quality inputs. Except for poultry products and to some extent for milk, markets for livestock and livestock products are underdeveloped, irregular, and uncertain and lack transparency. Further these are often dominated by informal market intermediaries who exploit the producers.
12. Likewise, slaughtering facilities are too inadequate. About half of the total meat production comes from un-registered, make-shift slaughter houses. Marketing and transaction costs of livestock products are high taking 15-20% of the sale prices.
13. The extent to which the pro-poor potential of livestock can be harnessed would depend on how technology, institutions, policies and financial support address the constraints of the sector. The number-driven growth in livestock production may not sustain in the long run due to its increasing stress on the limited natural resources. The future growth has to come from improvements in technology and service delivery systems leading to accelerated productivity, processing and marketing.
14. Only 6% of the animal heads (excluding poultry) are provided insurance cover.

- **First dog to space- Laika (Russia via sputnik-II)**

Chapter-2

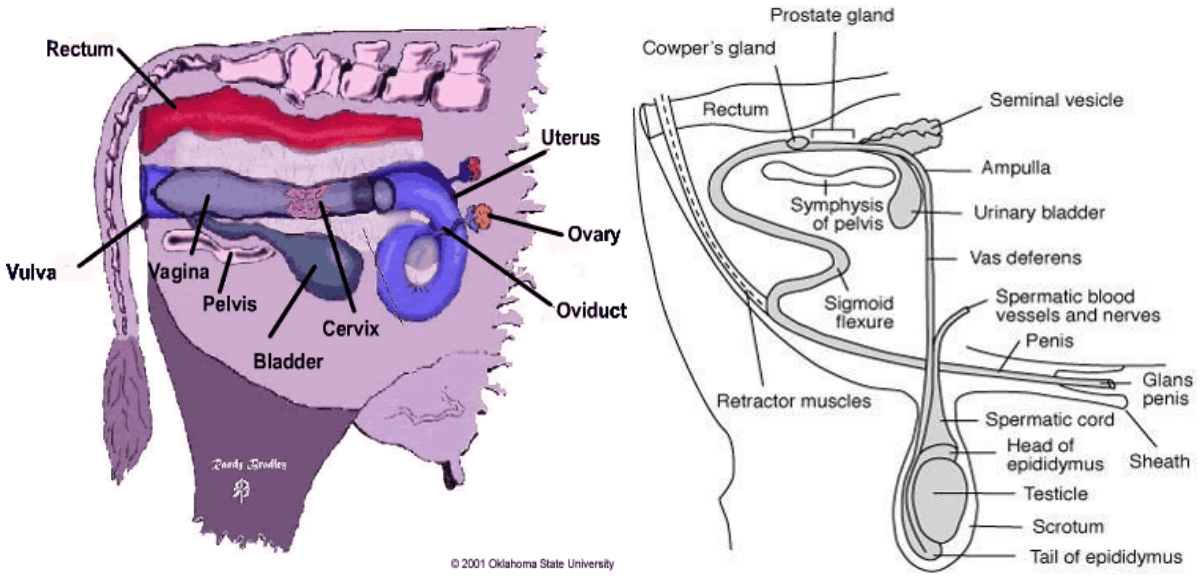
REPRODUCTION IN FARM ANIMALS AND POULTRY

Introduction

Reproduction is the process by which animals produce offspring for the purpose of continuing the species. The process of reproduction begins with copulation, which is the mating of a male and female of the species. Sperm cells from the male are deposited in the female reproductive tract and try to unite with an egg cell. When fertilization (a sperm cell and egg cell unite) occurs, an embryo begins to develop. The embryo attaches to the wall of the uterus where it is protected, receives nourishment, and develops. When the new offspring reaches the end of the gestation period, it is delivered from the female reproductive tract in a process called parturition. To completely understand the process of reproduction, a basic knowledge of the reproductive tract structures and functions is required.

The major functions of the male reproductive system include:

- Production of sperm cells, storage, and deposition of semen
- Production of male sex hormones
- Serve as passageway for expelling urine from the urinary bladder



Male Macrostructure and Function

Testes – Hanging in scrotum in the inguinal part, paired, ovoid shaped organs that produce sperm cells and testosterone.

Testosterone –Male sex hormone that is responsible for the development of secondary male characteristics and sex behavior (libido).

Spermatic cord - a fibrous sheath consisting of smooth muscle, blood vessels, and nerves.

Cremaster muscle – primary muscle supporting testes and coursing the length of the spermatic cord.

Scrotum – sac outside the body cavity that protects and supports the testes.

The spermatic cord extends from the body through the inguinal ring to suspend the testes within the scrotum.

The cremaster muscle, spermatic cord, and tunica dartos muscle raise and lower the testes to maintain a constant temperature (4 – 6 degrees below body temperature) for sperm to develop.

Epididymis – a coiled tube connected to each testis that is responsible for the maturation, storage, and transport of sperm cells.

Deferent Duct (Vas Deferens) – part of the spermatic cord that is the passageway for sperm from the epididymis to the urethra.

Ampullae – an enlargement of the deferent duct that opens into the urethra and may serve as a temporary storage depot for sperm.

Urethra – a passageway for both semen and urine that extends from the ampullae and bladder to the end of the penis.

Accessory Glands:

The accessory glands are responsible for the production of secretions that contribute to the liquid non-cellular portion of semen known as seminal plasma.

Semen and ejaculate are terms given to the sperm plus the added accessory fluids.

Vesicular glands (seminal vesicles) – paired accessory glands that secrete seminal fluid that nourishes the sperm and provides protection and transportation medium for sperm upon ejaculation.

Prostate gland – secretes thick, milky fluid that mixes with seminal fluid to provide nutrition and substance to the semen.

Bulbourethral glands (Cowper's glands) – secretes fluid that cleanses and neutralizes the urine residue that can kill sperm cells in the urethra.

Penis – the organ that allows for the deposition of semen into the female reproductive tract.

The penis of the stallion is vascular, which means that it depends on the engorgement of blood within certain tissues for erections to occur and it forms no sigmoid flexure when relaxed.

The penises of the bull, ram, and boar are fibroelastic, which means that they are primarily composed of connective tissue and depend little on blood for erections.

The rear portion of the fibroelastic type penis forms an S-shaped curve or **sigmoid flexure** when relaxed.

Male Microstructure and Function

Microscopic cellular parts within the testes produce sperm cells and testosterone.

Spermatogenesis refers to the development of sperm cells (spermatozoa) through a process of cell division and maturation.

Seminiferous Tubules – tubular structures that coil throughout the testes and are the site of spermatogenesis.

Spermatozoa (sperm cells) – haploid gametes of the male that are motile and tadpole-like.

Once matured, the sperm cells proceed to the epididymis where they are stored until ejaculation or absorbed by the body.

Unusual climatic conditions (extremely high temperatures) or stress on the male can temporarily halt sperm cell production causing reproductive failure upon breeding.

Interstitial Cells (Cells of Leydig) – group of cells between the seminiferous tubules that produce testosterone.

Testosterone – an androgen hormone that directs the development of secondary male characteristics and influences libido.

Secondary male characteristics include coarse hair, horns that are long and large at the base, a deep voice, and pronounced muscularity.

Structure and Function of the Female Reproductive System

The functions of the female reproductive system include:

- Produce egg cells (ova),
- Serve as receptacle for the penis during copulation, and
- House and nourish the fetus until parturition.

The female reproductive system is made up of several organs with specific functions

Female Macrostructure and Function

Ovaries – paired structures that produce eggs (ova) and the female hormones, estrogen and progesterone.

Broad ligaments – ligaments that support the female reproductive tract and arteries, veins, and nerves of the ovaries in the abdominal cavity.

Oviducts (Fallopian tubes) – paired tubes that transport the eggs from the ovaries to the uterus and serve as the site where sperm and ova meet and fertilization occurs.

Infundibulums – two funnel-like openings of the oviducts that pick up the eggs at ovulation and direct them to the body of the oviducts.

Uterus – a major reproductive organ that consists of the uterine body and two uterine horns.

The embryo attaches to uterine body or uterine horn, depending on the species.

The uterus varies in shape between livestock species from long uterine horns of the sow to relatively short uterine horns in the mare.

Functions of the uterus include:

- Passageway for sperm during copulation,
- Incubation and nourishment of the embryo during pregnancy, and
- Expulsion of the fetus during parturition by contractions.

Vagina – reproductive structure that serves as the receptacle for the penis during copulation and the birth canal at parturition; it also serves as a passageway for expelling liquid wastes, as the urethra joins the bladder to the vagina prior to the opening at the vulva.

Cervix – a thick-walled mass of connective tissue with a small tube-like opening that joins the uterus to the vagina; it serves as a passageway for semen during copulation.

It also contains glands that secrete a waxy-like substance that seals off the uterus during pregnancy and between heat periods to protect against infection, disease, or foreign matter.

Vulva – the external portion of the female reproductive tract that serves to protect the internal system from infection, to initially receive the penis at copulation, and to act as a passageway for urine.

Female Microstructure and Function

Oogenesis is the process of producing ova (eggs) in the follicles of the ovaries. Oogonia cells develop in the ovaries of the fetus and mature into oocytes by birth. Only a small proportion of oocytes develop into ova or reach ovulation. Oogenesis is part of the estrous cycle. The number of ova produced per cycle varies with each species. A cow or mare normally produces one ovum per cycle. A ewe produces two ova per cycle. A sow produces eight to fifteen ova per cycle.

Follicle – a blister-like mass on the surface of the ovary that contains a developing ovum and produces and stores estrogen. The follicle secretes estrogen as a signal to the rest of the reproductive tract to prepare for ovulation (release of the ovum from a mature follicle).

Corpus hemorrhagicum – a small hemorrhage or blood-clotted area that develops at the site of a ruptured follicle and lasts 2 – 3 days.
Corpus luteum – a yellow body of cells that develops in place of the corpus hemorrhagicum and produces progesterone.
Progesterone – the female sex hormone that functions to prepare the female reproductive system for pregnancy; it is produced by the corpus luteum and lasts about twelve days, unless the ovum is fertilized.
Corpus albicans – a white body of connective tissue that is the result of the degeneration and re-absorption of luteal tissue.
Estrus cycleis the chain of physiological events that begins at one oestrus period and ends at the next. Heat/oestrus is the intense sexual desire/excitement experienced by females.Reproductive cycle/Oestrus cycle of dairy animals consists of four phages-Proestrus, Estrus, Metestrus and Diestrus.
Anestrus: absence of estrus cycle in an animal.

Reproductive cycle of Domestic animals

Particulars	**Cow**	**Buffalo**	**Ewe**	**Goat**	**Sow**
Age of puberty (Months)	24-36	36-42	6-12	6-12	5-8
Oestrus cycle (Days)	21	21	17	18-20	21
Time of ovulation (Hrs)	10-14 after H	10-14 after H	At end H	At end H	35 after onset of H
Gestation period (Days)	280±5	310±5	155	155	115
Body temperature (0F)	99.5-101.5	99-102	102	103-104	102

Artificial insemination (A.I) in cattle

Artificial insemination (AI) is the process of collecting sperm cells from a male animal and manually depositing them into the reproductive tract of a female during proper time of oestrus. The technique of inseminating a cow is a skill requiring adequate knowledge, experience and patience. In the recto-vaginal technique a sterile, disposable catheter containing the thawed semen is inserted into the vagina and then guided into the cervix by means of a gloved hand in the rectum. The inseminating catheter is passed through the spiral folds of the cow's cervix into the uterus. Part of the semen is deposited just inside the uterus and the remainder in the cervix as the catheter is withdrawn. Expulsion of the semen should be accomplished slowly and deliberately to avoid excessive sperm losses in the catheter. Another method which gained popularity was the "speculum" method.

Advantages of Artificial Insemination:

There are several advantages by artificial insemination over natural mating or servicing.

- There is no need of maintenance of breeding bull for a herd; hence the cost of maintenance of breeding bull is saved.
- It prevents the spread of certain diseases and sterility due to genital diseases.
- The progeny testing can be done at an early age.
- The semen of a desired size can be used even after the death of that particular sire.
- The semen collected can be taken to the urban areas or rural areas for insemination.

- It makes possible the mating of animals with great differences in size without injury to either of the animal.
- It is helpful to inseminate the animals that are unable to stands or accept the male at the time of oestrum.
- It helps in better record keeping and oestrus synchronization.

Disadvantages of A.I:

- Requires well-trained operations and special equipment.
- Requires more time than natural services.
- Necessitates the knowledge of the structure and function of reproduction on the part of operator.
- If the bull is not properly tested, the spreading of genital diseases will be increased.
- Market for bulls will be reduced, while that for superior bull is increased.

A practical recommendation for timing of insemination

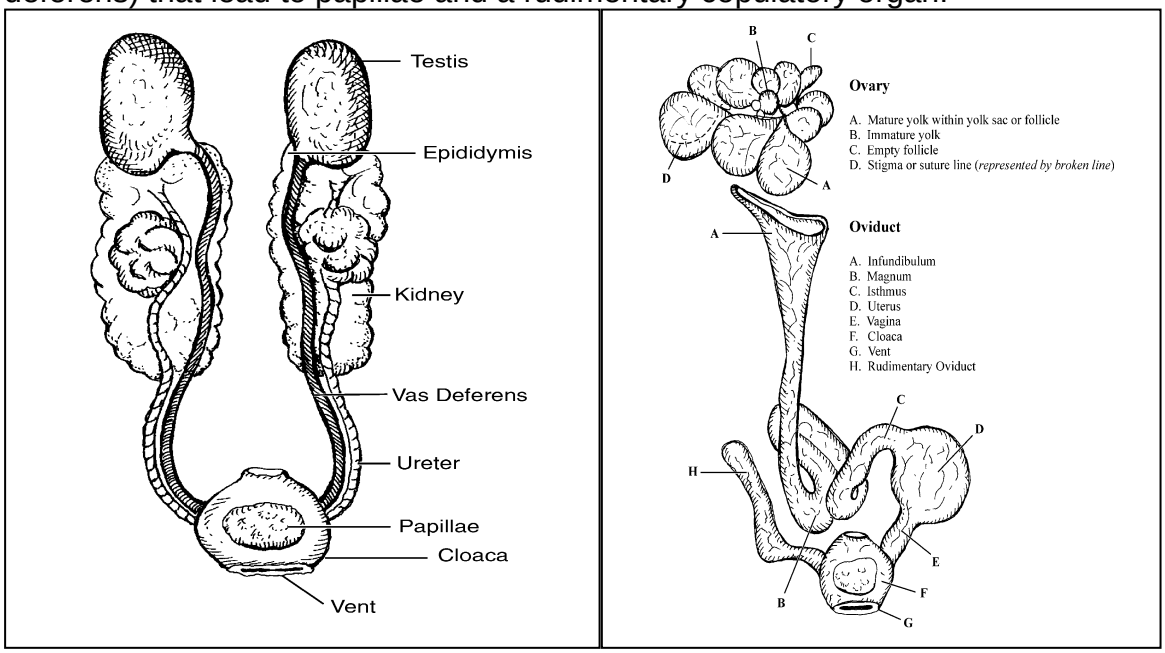
Cows showing oestrus	Should be inseminated	Too late for good results
In morning	Same day evening	Next day
In afternoon/evening	Next day morning/early afternoon	After 3 p.m.

Important terms: **Puberty, Free martin, Buller, Synchronization, Nymphomania, Capacitation, sterility/infertility, False mount, Teaser bull, Cryptorchidism.**

Structure and Function of the Reproductive System in Poultry

<u>Male Reproductive System in Poultry</u>

The male poultry anatomy consists of two testes (each with an epididymis and vas deferens) that lead to papillae and a rudimentary copulatory organ.



Unlike other livestock species, the testes of poultry are located within the abdominal cavity along the backbone.

The epididymis, which still functions in sperm storage, is relatively small in relation to the testes. The vas deferens extend from the epididymis to the cloaca and are

located on each side of the vertebral column. The vas deferens extends from the epididymis to the cloaca and are located on each side of the vertebral column. The vas deferens function in transportation of sperm and as sperm reservoirs.

Cloaca – the lower end of the avian digestive tract that provides a passageway for products of the urinary, digestive, and reproductive tracts.

Papillae – located at the end of the vas deferens and on the floor of the cloaca, the papillae emit semen into the cloaca of the female.

Phallus – a rudimentary copulatory organ that becomes engorged with lymph during mating, which allows semen to be deposited onto the female's everted cloaca; the phallus is more developed in ducks and geese.

Androgen – the male sex hormone produced by the testes.

Functions of androgen include:

- Directing sexual activity and the production of sperm,
- Controlling secondary sexual characteristics of the male, and
- Influencing social rank or "peck order."

Secondary sexual characteristics include comb growth, crowing or gobbling, spur development, and male feathering

Female Reproductive System

The functional part of the female poultry reproductive tract includes one ovary, an oviduct, and the cloaca.Mature female poultry have only one functional ovary; the right ovary and oviduct degenerate and cease functioning before the bird reaches sexual maturity. The ovary appears as a cluster of tiny, gray balls that are the oocytes. At maturity, the ovary contains up to 4,000 tiny oocytes from which ovum may develop over time. An ovum develops by collecting lipid particles from the blood to form the yolk. The yolk contains fat for energy and some protein and other nutrients needed by the developing embryo, as well as, a small white dot called the blastodisc that contains the genetic information supplied by the female.

When mature, the yolk is released by the follicle and engulfed by the infundibulum. The oviduct is about 25 inches long and consists of five parts: the infundibulum, the magnum, the isthmus, the uterus, and the vagina.

Infundibulum – funnel-like part of the oviduct that receives the yolk and is the site of fertilization.

Magnum – second part of the oviduct that secretes the thick white or albumen.

Isthmus – third part of the oviduct that adds the two shell membranes.

Uterus – the fourth part of the oviduct that secretes the thin white, the shell, and the shell pigment.

Vagina – the last part of the oviduct that holds the egg until it is laid.

From the oviduct, the egg passes to the cloaca and then out of the body through the vent at the time of laying. In addition to producing ova, the ovary produces the female sex hormone, estrogen, and the hormone androgen. The androgen hormone stimulates comb growth and works with other hormones in egg production.

In poultry, the functions of estrogen include:

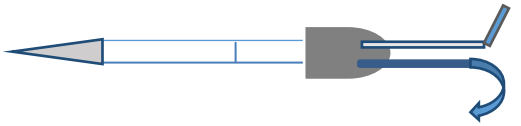
- Stimulating the growth of the oviduct
- Increasing the size of the cloaca during egg laying
- Modifying feather shape and pigmentation of the female and
- Increasing the level of fat, phosphorus, and calcium in the blood.

Artificial Insemination in poultry

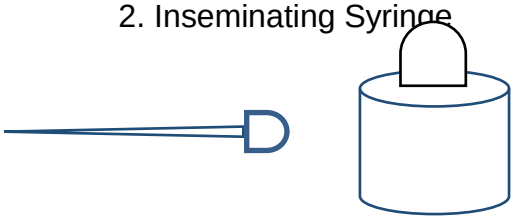
- As poultry semen cannot be preserved for long time use of AI is limited to research station and large commercial farms.

- Freshly diluted semen can be used up to one hour.
- Semen can be diluted by using normal saline in 1: 2 ratios.
- Collection of semen is done on alternate day/thrice weekly and food is to be held for 4-6 hrs. before collection.
- Normal semen volume: 0.5-0.7ml/cock
- Sperm concentration of semen: 3500-7000 million/ml
- Time of Insemination: when majority of birds have laid i.e. after 3.0 pm
- Required dose of semen/hen: 0.03ml
- AI equipment:

1. Collecting Apparatus



2. Inseminating Syringe



Sr. No.	Species	Volume (ml)	pH	Sperm Concentration (million/ml)
1	Bull	5 – 8	5 – 8	800 – 2000
2	Buffalo bull	2 – 4	2 – 4	630 – 2000
3	Ram	0.8 – 1.2	0.8 – 1.2	2000 – 4000
4	Buck	0.2 – 1.2	0.2 – 1.2	2000 – 3500
5	Boar	150 – 200	150 – 200	200 – 300
6	Stallion	60 – 100	60 – 100	150 – 300
7	Dog	1 – 25	1 – 25	27 – 125
8	Cock	0.2 – 0.5	0.2 – 0.5	3000 – 7000

Chapter-3

Housing Principles, Space requirements for different species of Livestock and Poultry

A well-planned and adequate housing is the basic need for efficient management of livestock and poultry. Proper planning in the arrangement of animal housing will reduce the labour charges and that is crucial for the profit of the owner. During erection of a house for dairy cattle, care should be taken to provide comfortable' accommodation for an individual cattle.

Principles of housing

1. Protection

- Protection from heat
- Protection from cold
- Protection from wind
- Protection from rain
- Protection from mud

2. Feeding

The manger must be designed so that the stockman can easily fill it from outside the housing area without disturbing the animals and as safely and most efficiently for himself as possible.

The manger must be designed so that all the animals in the lot have access to it at the same time, so that each can eat his share without being crowded out by the more aggressive. It is essential to respect a standard of 50 cm/per head at the trough.

The manger should be so designed as to cut down on waste and rejected food: withers and protection bars will keep the animals from climbing into the food, soiling it and scattering the uneaten portion on the ground

3. Watering

Water needs vary considerably with the kind of diet (silage fodder is 3/4 ths water in weight compared with 1/10 th for concentrated feed), climatic conditions, type of housing and so forth (the environmental surroundings).

And of course water needs vary with the weight of the animals (the average is ten litres of water per 100 kg of live weight per day).

4. Isolation

One function of housing is, of course, to ensure the isolation of the stock. They ought to live in the area reserved for them. They should particularly be protected from cohabitation with the other farm animals: poultry, dogs, small ruminants, and from cohabitation with man. Thus isolated, the stock remains calm and the risk of accident and contamination is lessened.

5. Comfort

First of all, the building must be properly *ventilated*, that is the air must circulate freely enough to avoid accumulations of carbon dioxide and ammonia from the exhalations and excreta of the stock.

The building must also allow the animals to get enough rest, when they want it, and moderate exercise as well.

Disadvantage of loose housing system

The animals are not sufficiently protected from inclement weather:

The animals will fight and hurt themselves:

Exercise will make the animals lose weight:
Difficult to maintain clean and hygienic condition at farm

Space requirements for different species of livestock and poultry

Animal	Covered area (m2) per animal	Open area (m2) per animal
Bulls	12	120
Cows	3.5	7.0
Down calves	4.0	8.0
Young calves	1.0	1.5
Older calves	2.0	4.0
Ewe/nanny	1.0-2.0	-
Lamb	0.4	-
Ram/buck	3.4	-
Milk Die	1.5-3.0	-
Boar	6.0-7.0	8.8-12.0
Farrowing sow	7.0-9.0	8.8-12.0
Poultry	**1 sq. ft/bird**	-

There are four systems of housing generally found to follow among the poultry keepers. The type of housing adopted depends to a large extent on the amount of ground and the capital available.

1. Free-range or extensive system
2. Semi-intensive system
3. Folding unit system
4. Intensive system
    A. Battery system
    B. Deep litter system

Free range system: This method is oldest of all and has been used for centuries by general farmers, where there is no shortage of land.
This system allows great but not unlimited, space to the birds on land where they can find an appreciable amount of food in the form of herbage, seeds and insects, provided they are protected from predatory animals and infectious diseases including parasitic infestation. At present due to advantages of intensive methods the system is almost absolute.
Semi-intensive system: This system is adopted where the amount of free spare available is limited, but it is necessary to allow the birds 20-30 square yards per bird of outside run. Wherever possible, this space should be divided giving a run on

either side of the house of 10-15 square yards per bird, thus enabling the birds to move onto fresh ground.

Folding unit System: This system of housing is an innovation of recent years. In portable folding unit's birds being confined to one small run, the position is changed each day, giving them fresh ground and the birds find a considerable proportion of food from the herbage are healthier and harder. For the farmer the beneficial effect of scratching and manuring on the land is another side effect.

The disadvantages are that food and water must be carded out to the birds and eggs brought back and there is some extra labour involved in the regular moving of the fold units. The most convenient folding unit to handle is that which is made for 25 hens. A Floor space of 1 square foot should be allowed for each bird in the house, and 3 square feet in the run, so that a total floor space to whole unit is 4 square feet per bird, as with the intensive system. A suitable measurement for a folding house to take 25 birds is 5 feet wide and 20 feet long, the house being 5' X 5', one third of Ibis fun. The part nearest the house is covered in and the remaining 10' open with wire netting sides and lop.

Intensive system:

In this system the birds are confined to the house entirely, with no access to land outside, and it is usually adopted where land is limited and expensive.

This has only been made possible by admitting the direct rays of the sun on the floor of the house so that par to the windows are removable, or either fold or slide down like windows of railway train to permit the ultraviolet rays to reach the birds. Under the intensive system, Battery (cage system) and deep litter methods are most common.

A. Battery system: This appliance is the inventor's latest contribution to the commercial egg farmer. This is the most intensive type of poultry production and is useful to those with only a small quantity of floor space at their disposal. Nowadays in large cities hardly a poultry lover can spare open lands for rearing birds. For all such people this system will prove worthy of keeping birds al minimum space.

In the battery system each hen is confined to a cage just large enough to permit very limited movement and allow her to stand and sit comfortably. The usual floor space is 14 X 16 inches and the height, 17 inches. The floor is of standard strong galvanized wire set at a slope from back to the front, so that the eggs as they are laid roll out of the cage to a receiving gutter. Underneath is a tray for droppings. Both food and water receptacles are outside the cage. Many small cages can be assembled together; if necessary It may be multi-storeyed. The whole structure should be of metal so that no parasites will be harboured and through disinfection can be carried out as often as required. Provided the batteries of cages are set up in the place which is well ventilated and lighted, is not too hot and is vermin proof and that the food meets all nutritional needs, this system has proved to be remarkably successful in [lie tropical countries. It may be that as it requires a minimum expenditure of energy from the bird, which spends its entire item in the shade, it lessens the load of excess body heat. The performance of each bird can be noted and culling easily carried out. Pullets, which are more often used than birds of over one year, should be placed in the cages at least one month before they are expected to lay.

The feeding of birds in cages has to be carefully considered, as the birds are entirely dependent on the mash for maintenance and production. To supply vitamins A and D, cod liver oil, yeast, dried milk powder are useful/ and fish meal or other animal protein, and balanced minerals and some form of grit must be made available.

As in each cage there will be only pullets so one can never expect fertilized eggs, hence the vegetative eggs will be there, which can be preserved for a longer time than fertilized eggs at ordinary room temperature but can never be used for hatching purposes.

B. Deep litter system: In this system the poultry birds are kept in large pens up to 250 birds each, on floor covered with litters like straw, saw dust or leaves up to depth of 8-12 inches. Deep litter resembles to dry compost. In other words we can define deep litter, as the accumulation of the material used for litter with poultry manure until it reaches a depth of 8 to 12 inches. The build-up has to be carried out correctly to give desired results, which takes very little attention.

Advantages of Deep Litter System:

Safety of Birds: Birds on rage of even in a netted yard can be taken by wild animals, flying birds, etc. When enclosed in deep litter intensive pen which has strong wire netting or expanded metal, the birds and eggs are safe.

Litter as a source of food supply: It may come as surprise to learn that built-up deep litter also supplies some of the food requirements of the birds. They obtain "Animal Protein Factor" from deep litter and some work indicates that this could learn that birds obtain sufficient of this to enable to suitable feed ration to be prepared with only a vegetable protein such as groundnut meal included in the feed. The level of vitamins such as riboflavin increases up to nearly three-fold. According to experiments conducted. The combination of this and the Animal Protein Factor is necessary to good hatchability of eggs and early growth of chickens.

Disease control: Well managed deep litter kept in dry condition with no wet spots around water has a sterilizing action. The level of coccidiosis and worm infestation is much lower when kept on good deep litter than with birds (or chickens) in bare yards and bare floor sheds particularly where water spillage is allowed.

Labour saving: This is one of the really big features of deep litter usage. Cleaning out poultry pens daily or weekly means quite a lot of work. With correct conditions observed with well managed litter there is no need to clean a pen out for a whole year; the only attention is the regular stirring and adding of some material is needed.

The valuable fertilizer: This is a valuable economic factor with deep litter. The level of nitrogen in fresh manure is about 1%, but on well built-up deep litter it may be around 3 per cent nitrogen (nearly 20% protein). It also contains about. 2 per cent phosphorus and 2 per cent potash, its value is about 3 times that of cattle manure.

Hot weather safeguard: This is an important feature in a hot climate. The litter maintains its own constant temperature, so birds burrow into it when the air temperature is high and thereby cool themselves. Conversely, they can warm themselves in the same way when the weather is very cool. Accordingly, it is a valuable insulating agent.

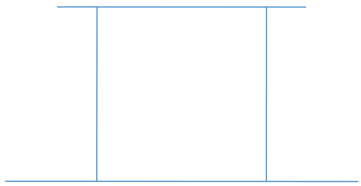
Loose housing:

Loose housing may be defined as a system where animals are kept loose except milking and at the time of treatment. The system is most economical. Some features of loose housing system are as follows:

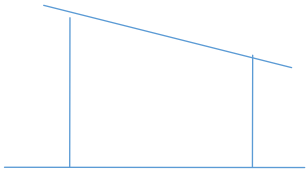
1. Cost of construction is significantly lower than conventional type.

2. It is possible to make further expansion without change.
3. Facilitate easy detection of animal in heat.
4. Animals feel free and therefore, proves more profitable with even minimum grazing
5. Animals get optimum exercise which is extremely important for better health production.
6. Over all better management can be rendered.

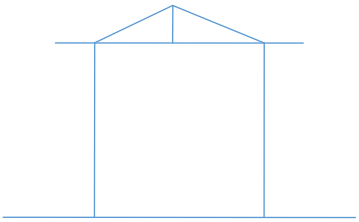
DIFFERENT TYPES OF ROOF FOR ANIMAL HOUSE



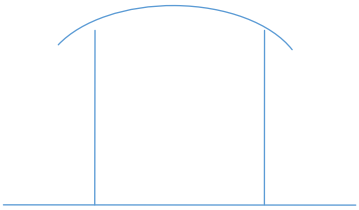
Flat



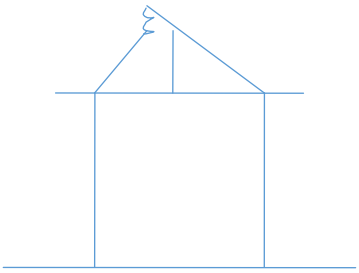
Shed



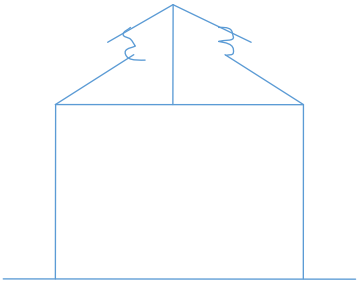
Gable



Dome



Half



Full

Chapter-4

Management of Calves, Growing Heifers and Milch animals

The replacement heifers and bulls are crucial for the profitability of dairy farms. Therefore, the success of dairy enterprises depends to a great extent on the proper management and care of the calves.

Methods of raising of calves

1. ***Suckling method***
2. ***Weaning method***

Care of calves

- The average birth weights of calves of Asian breeds vary from 24 to 45 kg.
- Remove mucus from nostril
- Give artificial respiration if necessary
- Allow the mother to lick the calve
- Clean the body of calf with cloth
- Remove yellow colored tender hooves
- Cut the naval cord 3 cm away from the body, with new blade and apply tincture iodine
- Feed colostrums to calf within 2 hours of birth @ 10 % of body wt.

Colostrum

Colostrum (biestings) is the cow's first milk after calving and is present for up to 6 milking. It contains antibodies and growth factors and is superior in nutritional value when compared with whole milk. At birth a calf's immune system is not fully developed. Colostrum imparts passive immunity from the dam to the newborn calf via intestinal absorption of antibodies and should be fed for the first 3-5 days after birth. Vitamins A, D and E do not cross the placenta from the cow to the calf. Thus, calves are born with low levels of these vitamins. Most of the essential minerals and vitamins are substantially more concentrated in colostrum than in milk. For example colostrum usually contains 6-10 times the amount of vitamin D present in ordinary milk. Inadequate feeding, or quality, of colostrum is a primary cause of low immunity in calves. In addition, deficiency of trace-elements and Vitamin E in late pregnancy can compromise the immune system of the neonate. This may increase susceptibility to scour, pneumonia, navel-ill, joint-ill etc. colostrums act as a laxative to free the digestive tract of faecal material and help in passing muconium.

Weaning

As milk feeding is one of the more labour intensive tasks associated with rearing calves, there may be a temptation to wean calves at an early age. Calves are generally weaned by either age or weight.

Body wt. (kg)	Calf age (days)	Colostrums (lt.)	Whole milk (lt.)	Skim milk (lt.)	Green grass
Up to 25	Up to 5	$1/10^{th}$	-	-	
20-30	6-20	-	$1/10^{th}$	-	
25-50	21-30	-	$1/15^{th}$	$1/20^{th}$	
30-60	31-60	-	$1/20^{th}$	$1/25^{th}$	*ad lib*
40-75	61-100	-	$1/25^{th}$	$1/25^{th}$	*ad lib*

Calf starter

Calf starter is a balanced concentrate mixture which is fed to the calves from day 10 to supplement limited milk intake. Normally 16 per cent of digestible crude protein and 70 per cent TDN in the calf starter should give a satisfactory growth rate. The quality of protein is important during pre-ruminant growth; sesame cake and a protein source appear better than groundnut cake (Das and Ranjhan 1978). Calf starters should contain around 20 per cent of good quality protein.

- **Calf starter contains**

Feed	**Amount %**
Maize	35
Barley	15
GNC	30
Wheat bran	10
Fish meal	07
Min mix	02
Salt	01
Antibiotic	100 g
Vitamin (rovimix)	15 g

Milk replacer

- Dry feed mixture reconstituted with warm water fed to calf for replacement of milk
- It contain 50% spray dried skim milk, 12% fat & 22% protein
- It lowers the cost of calf raising

Feed	**Parts**
Wheat	10
Fish meal	12
Linseed meal	40
Milk	13
Coconut oil	7
Linseed oil	3
Molasses	12
Min mix	1

Housing of calf

- Should be housed separately in a calf pen
- Not more than10 calves should be grouped together
- A space minimum of 25 sq. ft./calf should be provided
- Calf pen should be near to cow shed

Marking of calf

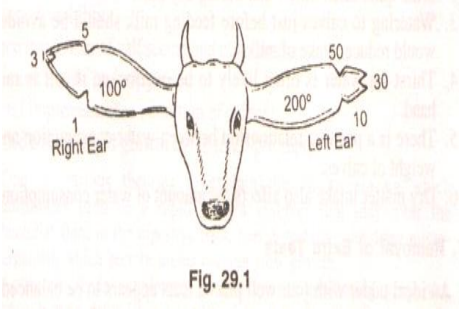


Fig. 29.1

Castration of calf

- 1. Open castration
- 2. Berdizzo's Emasculator

Disbuding/dishorning of calf

- Mechanical
- Chemical (KOH) at 2-3 weeks of age
- Electrical

Deworming and vaccination of calves

Against the intestinal parasites, bacterial and viral diseases like-FMD, H.S & B.Q

CARE AND MANAGEMENT OF GROWING HEIFERS

(Heifers are often said to be future cow)

Methods of raising heifers:

a) Grazing method or outdoor system:

1) In this method, heifers are fed at the grassland or pasture by allowing grazing.
2) Number of heifers should be proportional to grassland available.
3) Sufficient amount of legume should also be made available for feeding.
4) Rotational grazing should be preferred.

b) Stall feeding or Indoor system :

1) In this method, heifer are fed inside the stall and not allowed for grazing.
2) Legume hay and green fodders should be made available for feeding.
3) About 1 – 1.5 kg of concentrate mixtures should be given daily.
4) Mineral bricks or mineral mixture should necessarily be provided to achieve maximum reproductive performance or fertility.
5) Extra amount of concentrates should be fed during last half of pregnancy.
   This is called as steaming-up, for this purpose additional 1.5 kg of concentrate mixture
   (18%DCP, 65 – 70 % TDN) should be given daily.

ADVANTAGES OF STREAMING UP:

a) It helps in better growth of pregnant heifer and also of foetus.
b) It makes reproductive system ready for parturition.
c) It also facilitates proper udder development for incoming lactation.
d) It helps to produce more milk after calving.
e) It also increases lactation length.

6) A 15 days prior to calving the concentrate allowance is increased by 500 gms for building up of body reserves and to accustom for high concentrate feeding after calving. This is called as “challenge feeding”.

HOUSING

1) Heifer calves from 6 months to breedable age are to be housed separately.
2) Each heifer should get about 2metre sq. covered floor space and 4 meter sq. open are.
3) One month before calving, heifer should be housed along with other milking cows.

MANAGEMENT:

1) After every 4 – 6 months deworming should be done.
2) Daily grooming should be practiced.
3) Periodical spraying of insecticides like Malathion is necessary to avoid ectoparasites.
4) Perform timely vaccination against H.S., B.Q., Anthrax and F.M.D.
5) Branding should be done at the age of one year for identification.
6) During summer :
    a) Give cold water bath 2 – 3 times/day.
    b) Provide cool and clean drinking water.
    c) Protect from high environmental temperature.
7) Heifers kept indoor should get sufficient exercise.
8) Cutting of heifers having defects or stunned growth should be done.
9) Breeding :
    a) Age of breeding in Indian cow heifer is 2 – 3 years while in crossbred heifer it is 1 – 2 years.
    b) Time of breeding should be decided when they attain 60 % of their mature body weights.
    c) Gynecological examination of heifer should be carried out mainly for checking soundness of reproductive tract.
    d) Proper heat detection should be done.
    e) At breedable age proper insemination with semen of proven sire or natural service should be given.
10) In pregnant heifers, udder should be washed with warm water and mopped with duster before calving to accustom them for future milking.

CARE AND MANAGEMENT OF MILKING/MILCH ANIMALS

HOUSING:

1) Each cow requires about 5 x 1.2 m barn space.
2) Each cow requires 1.5 x 1.2 m standing space and 0.6 to 0.7 feeding space.
3) The shed for milking animals should be at higher plane and near to calf pen and milk collection room.
4) Flooring should be hard, impervious, non-slippery and with slope.
5) House should be well ventilated, and should protect the milking stock from rain, strong sunlight, wind etc.
6) There should be separate manger for each cow.

Feeding:

1) Feeding should be planned to get peak production in about 2 to 3 months of lactation and mature body weight in 2^{nd} lactation.
2) Roughage portion of diet should include green as well as dry fodders.
3) While feeding green legumes, also provide dry fodder to ensure adequate consumption of dry matter and to avoid possibility of bloat.
4) The interval between feeding of coarse roughages and concentrate should be at least 2 hrs. otherwise the digestibility of concentrates is also reduced.
5) Usually concentrate allowance is given at the time of milking which stimulates the process of letdown of milk.

6) For indigenous cow, 1 kg of concentrate mixture (16 % DCP) per 2.5 – 3 kg of milk produced is given in addition to maintenance allowance for buffalo and cross bred cows , this proportion is 1 kg/2 – 2.5 kg of milk produced.
7) The concentrate mixture should contain required quantity of important minerals like calcium and phosphorus.
8) Pelleted feed is generally preferred than mash feed for milking animals.
9) At about 15 days of calving, give slightly more quantity of concentrate than actual production which is called as challenge feeding or lead feeding.
10) A concentrate mixture should be soaked or sprinkled with water to lessen its dustiness before feeding at the time of milking.

MANAGEMENT:

1) Milking cows should be handled with kindness.
2) Milking shed and cow should be washed before milking.
3) Grooming should be performed 2 hours before milking, to avoid contamination of milk with hairs, dust or dung particles.
4) Before milking udder should be wiped off with a cloth dipped in antiseptic solution.
5) Gentle, rapid and complete milking should be done by adopting correct method.
6) Avoid excitement of cow before and during milking.
7) For safe milking secure hind legs with anti-cow kicking device or 8 knot.
8) Follow regular milking time and uniform interval between two milking.
9) Usually cows are milked two times a day. However in cow giving more than 10 lit. of milk per day , 3 times milking is recommended which increases 10 – 15 % milk production.
10) Cow should be inspected daily for any health problem.
11) Periodical testing of milk for mastitis should be done.
12) Cows in the herd should be tested each year for contagious disease like tuberculosis, Johne’s disease and Brucellosis.
13) Dry the cow 60 days before expected time of calving.
14) Routine vaccination and deworming schedule should be followed .
15) Regular spraying of insecticides should be practiced to control ectoparasites.

Chapter- 5

MANAGEMENT OF SHEEP, GOAT AND SWINE

Sheep along with goats were perhaps the first ruminants to be domesticated by man. Sheep/Goat farming is an important livestock sector in agrarian economy, especially in area where crop and dairy farming are not economical. Goat is a widest range utility, it provide a kind of products like meat, milk, skin, manure, best quality fibre i.e. pashmina, the tough long fibre mohair and of course, the rough hair for carpet. Sheep/Goat has a great and important contribution in the rural economy. Specifically in mountainous, semi-arid and arid regions of India. There are more than 25% goats among the total livestock in the country.

Common terms used for sheep/goat/pig

Species	Female	Male	Young one	Act of parturition	Av. Life Years	Meat	Group
Goat	Doc	Buck	Kid	Kidding	12-15	Chevon	Herd
Sheep	Ewe	Ram	Lamb	Lambing	12-15	Mutton	Flock
Swine	Sow	Bore	Litter	Furrowing	8- 10	Pork	Drift/litter

Character	Sheep	Goat
Species name	*Ovis aries*	*Capra hircus*
Chromos. No.	54	60
Group	Flock	Flock/band
Castrated male	Wether/ wedder	Wether
Sound produced	Bleating	Bleating
Act of mating	Tupping	Serving
Act of parturition	Lambing	Kidding
Feeding behaviour	Grazing	Browsing

The systems of sheep and goat production can be divided into the following categories:

1. Fine wool production from sheep and goats as the main products and meat as a by-product.
2. Meat production from sheep and goats as the main product and wool, fibre and skin as by-products.
3. Dual purpose sheep and goats with the main emphasis on milk or meat production or milk and meat given equal importance.

Within the meat and dual production systems the following four management systems can be identified:

1. Extensive (migratory, free range, pasture or range grazing).
2. Semi-intensive (pasture or range grazing, use of supplementary feeding mainly on crop residues and conserved roughage).
3. Intensive (grazing on improved pastures, zero grazing, conserved forage, crop residues and increased use of concentrates).
4. Tethering (small size flocks of 2–10 animals). This is a subsistence family system and the animals live on kitchen remnants crop residues, grazing near inhabited areas and other supplementary feed).

In the migratory system sheep and goat farmers make use of the seasonal pastures located in different areas. In the mountainous regions of Asia, Europe and North America climatic conditions limit growth of vegetation in winter and so flocks are moved to lowlands; in summer flocks are moved to highlands where feed is available. In the semi-arid and arid regions land use is seasonal and movement of the animals is dictated by rainfall and availability of grazing.

Feeding management of Sheep/Goat

Feeding behaviour

Goats have been considered more efficient in the digestion of crude fibre and the utilization of poor roughages than sheep. The higher the quality of the roughage, the higher the intake and performance with sheep or goats on all roughage diets. The voluntary intake of lactating ewes and goats is 50 to 100% higher than dry animals. The feeding behaviour of sheep is called as grazing while of goat is browsing.

Concentrate feed ingredients for sheep and goats

- Sorghum
- Maize
- Broken rice
- Jowar
- Soya bean cake
- Groundnut cake

Flushing ewes

- About 2 to 3 weeks before the onset of the breeding season, nutrition of ewes should be stepped up to promote their body weight.
- This practice will bring ewes into heat earlier in the season thereby giving early lambs.
- It also has the effect of bringing the ewes into heat a more nearly the same time, resulting in a more uniform lamb crop.
- Besides, flushing also increases the lambing rate and incidence of multiple births in the flock.
- This period is usually during the latter half of May in India.
- Different flushing rations are furnished below and any one method can be followed depending upon the availability of feed resources.

Suggested flushing rations

- A good mixed pasture of legumes and grasses,
- A grass pasture plus 150 g of wheat bran per head per day,
- Grass pasture plus 250 g of grains and 450 g of oil cakes,
- Legume hay full fed plus 100 g of wheat bran and 150 to 200 g of grain and
- Green fodder at the rate of 10 per cent of body weight and 150-200 g of concentrate per head per day.

The common practice is to allow the rams/bucks to graze with the ewes, which will allow the rams to get the same ration as the ewes/does. Separate feeding should be practiced for the ram/buck, it may be given 300-500 g of concentrate mixture consisting of three parts oats or barely, one part maize and one part wheat per day.

Colostrum feeding of kids

- The kid should be allowed to suck its dam for the first three or four days so that they can get good amount of colostrum.
- Colostrum feeding is a main factor in limiting kid losses.
- Cow colostrum is also efficient for kids.
- Colostrum is given at the rate of 100 ml per kg live weight.
- Colostrum can be preserved with 1-1.5% (vol/wt) propionic acid or 0.1% formaldehyde. Propionic acid is preferred for preservation as it keeps the pH value low.

- The chemically treated colostrum is kept at cool place to ensure better quality.

Creep feeding for kids

- This creep feed may be started from one month of age and up to 2-3 months of age
- The main purpose of creep feeding is to give more nutrients for their rapid growth.
- The general quantity to be given to the kids is 50 – 100 gm/animal/day.
- This should contain 22 per cent protein.
- Antibiotics like oxytetracycline or chlortetracycline may be mixed at the rate of 15 to 25 mg/kg of feed.

Composition of ideal creep feed

- Maize - 40%
- Ground nut cake -30 %
- Wheat bran – 10 %
- Deoiled rice bran- 13 %
- Molasses – 5%
- Mineral mixture- 2%
- Salt – 1% fortified with vitamins A, B2 and D3 and antibiotic feed supplements.

Management of sheep and goats during the reproductive cycle

In intensive sheep and goat systems feeding is based on the nutrient requirements of the animals and the nutritive value of feeds with the formulation of a ration which meets the daily requirements of the animals. Under these conditions feed intake of sheep and goats can easily be measured and available feedstuffs can be given in quantities needed to maintain good body condition. For example at the declining stage of lactation feed is offered according to milk yield. Twin suckling ewes are fed separately from single suckling ewes, or yearlings. During late pregnancy better nutrition is given to yearlings and leaner ewes and early and late lambing ewes and goats are also fed separately. Sheep and goats in intensive systems may rely on large quantities of crop residues or on small quantities of roughage and crop residues with higher quantities of concentrates. The use of concentrates is justified only if local meat and milk prices are high.

With semi-intensive and particularly extensive systems of management supplementing grazed roughage which varies in quantity and quality is a problem. In temperate climates there is usually adequate pasture and supplementation arises only when there is overstocking or when the time of lambing is changed for example with lambing at the end of the grazing season. In highlands as well as in tropical, semi-arid and arid regions the production of roughage is seasonal and varies widely both in quantity and quality. Under these conditions grazing sheep and goats respond to energy, protein and phosphorus supplements when grazing poor quality roughage and vitamin A when animals subsist on dry roughage for more than 4 months.

There is no doubt, particularly with extensive systems of management, that the situation can be improved with increasing the feed resources. Either by increasing the available land and thus increasing roughage production or by improvement of the existing land for increasing production or by supplementary feeding. In addition to increased roughage production and supplementary feeding, improved flock management is necessary. Stocking rate must be decided according to the animal carrying capacity at the worst time of the season, unless supplementary feeding is available at times of roughage scarcity. Part of the existing pasture can be improved and fenced. This area is reserved for grazing when most needed. In these improved areas animals may be brought at mating, during late pregnancy and early lactation. Leaner ewes or ewes suckling twins and yearlings can also make use of the

reserved areas. When the quantity of pasture produced from this improved and reserved pasture is not adequate, crop residues, hay, silage and concentrates are used to supplement the animals at times of need.

Mass mating- one ram per 35 - 40 ewes. It is very important to endeavour for mating the young ewes separately from the mature ewes.

Single mating- one ram per 50 ewes.

With regard to the above, it is very important to keep rams in small shady camps during hot periods with a small amount of growing supplement and rams should only be let loose among ewes during the evening. This system works particularly well in cases where goats are penned at night.

Controlled servicing- Try to do this in cool weather wherever possible. A ram can cover an ewe every half hour.

Artificial insemination: Artificial insemination is a technique whereby semen collected from the buck is deposited by an AI service provider in the right place in the reproductive tract of the doe at the appropriate time. Usually the semen used is processed. After collection and evaluation, the semen that meets the required standards is extended to increase its volume so that it can give many breeding doses. Semen extension involves use of semen diluents or extenders that will nourish the spermatozoa and provide a good environment for their survival. The volume of extender added to the semen is worked out in such a manner that the resulting doses obtained from each ejaculate will contain a sufficient number (i.e. at least 20 million spermatozoa in each straw at the time of freezing, with at least 8 million being alive post-thaw) to cause fertilization. After extension the semen is packed, commonly in straws, and can be used fresh within a few hours, chilled for use within a few days, or frozen in liquid nitrogen for use even after many years. The standard procedure for inseminating does involves raising the rear quarters of the doe, with the forequarters on the ground, and with the help of a speculum and light source, locating the right position and depositing semen into the female reproductive tract.

Telescoping: keeping ram with the herd of mature ewes/does synchronises the oestrus of ewes.

Difficulties of Goat Farming In India

In India the main difficulties which are obstructing goat farming are listed below-

- Lack of sufficient knowledge about goat farming effectively. And the people are not using modern farming methods in goat rearing business.
- Absence of specially-designed housing and management facilities which are very useful for goats.
- The beginners without any practical goat rearing training faces high mortality rate in goats due to some fatal goat diseases like PPR, pneumonia, diarrhoea, tetanus etc. As they lose money during first time, they don't want to start rearing goats again.
- The goat producers lack information about the right breed suitable for their agro climatic conditions. Non-availability of all vaccines (especially PPR) and veterinary doctor throughout the country.
- In some regions of India the producers don't get proper price for their farm products. Which discourage them in large production.

Management of Pig

The fast growing population need an integrated approach in various sectors of livestock farming. Among the various livestock species, piggery is most potential source for meat production and pigs are more efficient feed converters after the

broiler. Apart from providing meat, it is also a source of bristles and manure. Pig farming will provide employment opportunities to seasonally employed rural farmers and supplementary income to improve their living standards.

The advantages of the pig farming are:

- Pig has got highest feed conversion efficiency i.e. they produce more live weight gain from a given weight of feed than any other class of meat producing animals except broilers.
- Pig can utilise wide variety of feed stuffs viz. grains, forages, damaged feeds and garbage and convert them into valuable nutritious meat. However, feeding of damaged grains, garbage and other unbalanced rations may result in lower feed efficiency.
- They are prolific with shorter generation interval. A sow can be bred as early as 8-9 months of age and can farrow twice in a year. They produce 6-12 piglets in each farrowing.
- Pigs are known for their meat yield, which in terms of dressing percentage ranges from 65 - 80 in comparison to other livestock species whose dressing yields may not exceed 65%.
- Pork is most nutritious with high fat and low water content and has got better energy value than that of other meats. It is rich in vitamins like thiamine, Niacin and riboflavin.
- Pigs store fat rapidly for which there is an increasing demand from poultry feed, soap, paints and other chemical industries.
- There is good demand from domestic as well as export market for pig products such as pork, bacon, ham, sausages, lard etc.

Scope for pig farming and its contribution to national economy

The pig population of the country is 11.1 million. Pork production in India is limited, representing only 7% of the country's animal protein sources. Production is concentrated mainly in the north-eastern corner of the country and consists primarily of backyard and informal sector producers. The Indian market for processed pork products is small, and the majority of this market is supplied through imports. Although there are some local companies which manufacture processed products such as sausages and bacon, quantities are limited and the industry is small.

Housing management of pigs

Adequate housing and equipment for raising pigs are necessary to provide shelter against inclement weather, prevent diseases, control parasites and save labour. While it is desirable to plant trees in the neighbourhood of pens for reducing the intensity of heat. But it is not desirable to plant trees for giving regular shade because they permit rapid build-up of parasite levels.

The normal requirement of floor area, water and air space in pens for various classes of pigs is given below

Class of animals	**Covered floor area per animal (m^2)**	**Open-yard area per animal (m^2)**	**Water required (litres)**
Boar	6.25-7.5	8.8-12.0	45.5
Farrowing	7.5-9.0	8.8-12	18-22
Weaner	0.96-1.8	8.8-12	3.5-4
Dry sow	1.8-2.7	1.4-1.8	4.5-5

Farrowing Pen **Piglet/creep pen**



Wallows

Pigs have very few sweat glands. In areas having warm weather mature breeding animals and fattening animals need a wallow during summer months. Instead of permitting unsanitary wallows a masonry wallow with proper drainage would be desirable. The size of the wallow will depend upon the number and size of the animals.

Feeding Management of pig

Points to be considered while formulating feeding ration:

- Most economical ingredients should be selected
- Grains- maize, sorghum, oat, other millets, wheat and rice should form the basic ingredients
- Protein supplements - oil cakes and fishmeal and meat meal
- No vitamin supplements is necessary if the pigs are allowed to pasture or are fed fresh green legumes. Vitamin B 12 supplement would be necessary if little or no animal protein is fed
- Antibiotic supplements at the rate of 11 mg of antibiotic per kilogram of ration
- Mineral supplements should be provided

The following table gives specifically the various requirements in the formation of creep, grower and finisher rations for pigs.

Nutrients	**Creep feed (Up to weaning)**	**Grower ration (20-40 kg)**	**Finisher ration (40-90 kg)**
Protein supplement (%) Oilcakes	16-18	14-16	13-14
Animal protein	8-10	4	2
Grains (Maize, sorghum, millets or combination of grains) (%)	60-65	50-55	40-50
Wheat bran or rice bran (%)	5	10	20

Lucerne meal (%) if available	--	5-8	--
Mineral mixture(%)	0.5	0.5	0.5
Antibiotic supplement (mg)	40	20	10

The composition of the concentrate feed for various age groups pigs

Ingredients	**Creep feed (14th to 56th day**	**Grower ration (up to 40 kg)**	**Finisher ration(40-90 k.g)**	**Pregnant and nursing sows**
Maize or sorghum or broken wheat, broken rice and barley in convenient combinations	65	50	50	50
Oil cakes (groundnut oil cake, soya bean oil-cake, sesame oil cake, linseed oilcake	14	18	20	20
Molasses	5	5	5	5
Wheat bran or rice bran	10	1.5	25	18
Fishmeal or meat meal or cooked offal, skim milk powder dairy wastes	5	5	3	5
Mineral mixture	1	1.5	1.5	1.5
Salt	--	0.5	0.5	0.5

The most convenient way to feed animals on a farm is to prepare the complete ration recommended for different classes and give the pigs the amount they will eat without waste two or three times daily. The following is the approximate amount of dry feed the pigs will consume.

Weight of pig (kg)	**Daily consumption of feed (kg) per pig**
25	2.0
50	3.2
100	5.3
150	6.8
200	7.5
250	8.3

It is important not to overfeed sows which have been bred. Over fat sows are apt to produce weak pigs and crush more piglets at farrowing. Sows should gain about 35 kg and gilts about 55 kg from breeding to farrowing.

Breeding Management

Age to breed gilts : 8 months

Weight of breed gilts : 100-120 kg

Length of heat period : 2-3 days

Best time to breed in heat : Gilts – first day/ Sows- Second day

period

Number of services per sow	: 2 services at an interval of 12-14 hours
Period of oestrous cycle	: 18-24 days (Average 21 days)
Occurrence of heat after weaning	: 2-10 days
Gestation period	: 114 days

Selection of breeding stock

Each producer at the time of setting up his herd should purchase his animals from a reliable disease free herd and should obtain as much information of the animals as possible. Once the herd is established the selection of the gilts and boars for replacement in the breeding herd should be based on the types and performance.

Age of breeding stock

- Well-developed gilts may as a general rule bred to farrow when 12-14 months old. This depends more on development than on age. Gilts should weigh at least 100 kg before breeding. Ovulation rate increases during successive estrous periods (up to fifth) following puberty. Thus it is advantageous to delay the breeding of gilts until the second or third estrous.

Detection of heat

- The average length of estrous cycle in pigs is 21 days. The estrous symptoms last for five to seven days beginning with vulvar swelling and vaginal discharge. The application of pressure on the back is used to determine the correct breeding time. Best time for breeding is during the latter half of the first day or early on the second day of estrous.

Flushing

It is the method of feeding sows and gilts before breeding. A good grower ration fed to sows and gilts seven to ten days before breeding is helps in increased ovulation rates in them. After breeding sows and gilts should be fed a limited but well balanced ration until the last six weeks of pregnancy and then full feeding should be resumed.

Care and management of pregnant animals

The gestation period of sow varies from 109-120 days with an average of 114 days. Pregnant animals should be housed in groups in separate enclosures and should not be mixed with new animals to avoid fighting which at times may result in abortion. It would also be advisable to house pregnant gilts and sows in separate groups during gestation. About 3 m^2 of dry housing should be available for each sow. The pregnant animals should be allowed to move about every day in the morning on a free range or a pasture if available. A pasture area is presumed to be clean if a cultivated crop was raised.

Management at farrowing

An attendant should be on hand when the sow farrows. Otherwise many piglets will die. It takes generally 2 to 4 hours for complete farrowing to take place. The piglets should be removed as they are farrowed and kept warm in the creep space until farrowing is complete. Each piglet should be cleaned of all mucus to ensure that the breathing passages are clear. The navel cord should be tied 2-5 cm away from the navel, cut with a disinfected pair of scissors and the stumps painted with iodine. Piglets should be allowed to be nursed after birth. In about 2 days they settle down to their individual teats. They nurse 8-10 times in 24 hours in the initial period. Trampling by the sow should be prevented during the first two weeks.

Chapter-6:

Incubation, Hatching and Brooding. Management of Growers and Layers

Incubation and Hatching

Types of incubation

1. Natural
2. Artificial incubation by incubator

Types of incubator

1. Flat type (natural draft incubator/hot air type)
2. Cabinet type (force draft incubator)

Incubation is the **act** Forced draft incubators

I. Based on heating source:

1. Hot air incubator
2. Hot water incubator

II. Based on fuel used

Gas operated incubator

Oil operated incubator

Farm operations

1. **Collection/grading of eggs**
2. **Selection of eggs**
3. **Storage of eggs**
4. **Setting conditions**
5. **Candling of eggs:** Candling is performed to assess the viability of eggs. Candling is usually practiced when eggs are transferred from setter to hatcher. Provisions should be made to dark the room to facilitate easy candling.This room is usually constructed in between setter and hatcher room for candling eggs.
6. **Fumigation of eggs**
7. **Management of birds**

Principles of Incubation

Five major functions are involved in the incubation and hatching of poultry eggs. They are:

1. Temperature
2. Humidity
3. Ventilation (Oxygen and Carbon dioxide level and air velocity)
4. Position of eggs
5. Turning of eggs

Hatchery Operations

The operation of a chick hatchery involves the production of the largest number of quality chicks possible from the hatching eggs received at the hatchery. In addition, chicks must be produced economically. The sequences of hatchery operations followed in commercial hatcheries are

Advantages

1. Securing hatching eggs
2. Traying hatching eggs
3. Fumigation
4. Cold Storage
5. Warm eggs prior to setting
6. Loading of eggs

7. Candling
8. Transfer of eggs
9. Pulling the hatch
10. Hardening
11. Grading
12. Sexing
13. Vaccination
14. Chick delivery
15. Washing and cleaning
16. Disposal of waste

Brooding

Brooder house: Brooder house should be draft-free, rain-proof and protected against predators. Brooding pens should have windows with wire mesh for adequate ventilation. Too dusty environment irritates the respiratory tract of the chicks. Besides dust is one of the vehicles of transmission of diseases. Too much moisture causes ammonia fumes which irritate the respiratory tract and eyes. Good ventilation provides a comfortable environment without draft.

Brooding temperature:

Heating is very much essential to provide right temperature in the brooder house. Too high or too low a temperature slows down growth and causes mortality. During the first week the temperature should be 95°F (35°C) which may be reduced by 5°F per week during each successive week till 70°F (21·10C). The brooder should be switched on for at least 24 hours before the chicks arrive. As a rule of thumb the temperature inside the brooder house should be approximately 20°F (-6·7°C) below the brooder temperature Hanging of a maximum and minimum thermometer in each house is recommended to have a guide to control over the differences in the house temperature. The behaviour of chicks provides better indication of whether they are getting the desired amount of heat. . When the temperature is less than required, the chicks try to get closer to the source of heat and huddle down under the brooder. When the temperature is too high, the chicks will get away from the source of heat and may even pant or gasp. When temperature is right, the chicks will be found evenly scattered. In hot weather, brooders are not necessary after the chicks are about 3 weeks old. Several devices can be used for providing artificial heat. Hover type electric brooders are by far the most common and practical these days. The temperature in these brooders is thermostatically controlled. Many a times the heat in the brooder house is provided by use of electric bulbs of different intensities. Regulation of temperature in such cases is difficult although not impossible. Infrared lamps are also very good for brooding. The height and number of infra-red lamps can be adjusted as per temperature requirement in the brooder house.

Brooder space:

Brooder space of 7 to 10 sq inch (45-65 cm2) is recommended per chick. Thus a 1·80 m hover can hold 500 chicks. When small pens are used for brooding, dimension of the house must be taken into consideration as overcrowding results in starve-outs, culls and increase in disease problems.

Brooder guard:

To prevent the straying of baby chicks from the source of heat, hover guards are placed 1·05 to 1·50 m from the edge of hover. Hover guard is not necessary after 1 week.

Floor space:

Floor space of 0·05 m2 should be provided per chick to start with, which should be increased by 0·05 m2 after every 4 weeks until the pullets are about 20 weeks of age. For broilers at least 0·1 m2 of floor space for female chicks and 0·15 m2 for male chicks should be provided till 8 weeks of age. Raising broiler pullets and cockerel chicks in the separate pens may be beneficial.

Water space:

Plentiful of clean and fresh water is very much essential. A provision of 50 linear cm of water space per 100 chicks for first two weeks has to be increased to 152-190 linear cm at 6 to 8 weeks. When changing from chick fountain to water trough the fountains are to be left in for several days till the chicks have located the new water source. Height of the waterers should be maintained at 2·5 cm above the back height of the chicks to reduce spoilage. Antibiotics or other stress medications may be added to water if desired. All waterers should be cleaned daily. It may be desirable to hold a few chicks one at a time and teach them to drink.

Daily management of chicks

Chicks should be checked four times a day, taking note of any abnormal behaviour and ensuring that they are healthy and not heat- or cold-stressed (Barnett and Glatz, 2004). They should be observed to see if they are able to eat and drink successfully from the equipment provided. Any dead chicks should be removed, and litter should be dry.

- **Factors affecting hatchability**

1. Breed
2. Housing
3. Age of birds
4. Health of birds
5. Male female ratio
6. Age of breeders
7. Quality of eggs
8. Storage of eggs
9. Feeding/nutrition of bird
10. Collection/grading of eggs
11. Vaccination of birds and sanitation of farm
12. Incubator conditions
13. Rate of egg production
14. Bacterial contaminations
15. Fertility of eggs
16. Age of males
17. Length of lay
18. Inbred lines
19. Weather
20. Inheritance
21. Sperm density
22. Nutrition of breeder birds

LAYER MANAGEMENT

Space Requirement Data

Age	Floor space (sq.ft./bird)		Feeding space (inches)	Watering space (inches)	Height of feeders & waterers	Litter depth (inches)
	DL	CS				
0-8 weeks	0.5	0.25	2.0	0.6	1.5	3
9-16 weeks	1.0	0.55	2.5	0.8	2.5	4
17-76 weeks	2.0	0.80	3.0	1.0	5.0	6

Vaccination Calender

The vaccination schedule is a general guide. Each farm and area will require some changes in the schedule. Following table can be used as a general guideline.

It is necessary to keep proper records on date of vaccination and on vaccines used

including type, brand, and serial number, date of purchase and date of use of vaccine.

Pointers for higher egg production

1. Quality Birds

Choose the strain that will perform best and is known to have good livability under reasonable environmental conditions. Good chicks may cost more but they will perform better and pay more too.

2. Housing

There should be ample fresh air, free from drafts. Air must be circulating. High levels of non-desirable gases decrease growth rate and increase flock's susceptibility to respiratory disease. Ensure that the litter is dry. A well-managed litter helps the birds in putting on feathers and improves feed conversion. It also reduces coccidiosis problem.

3. Crowding

Overcrowding increases mortality, stress, as well as production cost.

4. Feeding

Always ensure adequate fresh feed. Birds that are without feed for six hours will record a drop in production and a 12 hour starvation will result in moult of wing feathers. There should be adequate feeder space for the birds. Guard against feed wastage. Maintain records of daily feed consumption. It will enable to determine feed utilization and bird's performance.

5. Watering

Provide plentiful and clean disinfected water. This management factor, although obvious, is commonly violated. Water restriction is a quick way to accidentally force the flock to moult. Ensure that the waterers are so placed that they are easily accessible to birds.

6. Lighting

The duration of light should be 16 hours per day, but not beyond 17 hours. No advantage is obtained by exceeding this limit. The amount of light given to the flock in one day should never be less than that given the day before. A decreasing day length can prematurely cause hens to go out to production. One 40 watt electric bulb is sufficient for 200 sq.ft. area.

7. Vaccination

Ensure that all birds are vaccinated for Marek's Disease and Ranikhet Disease. Birds not vaccinated are highly susceptible to these diseases.

8. Debeaking

Follow correct debeaking programme. Poor debeaking can adversely affect egg production.

9. Culling

Unsuitable and uneconomic birds should be timely culled.

10. Health

Watch for early signs of disease for its timely treatment before it flares up in a big way. Some of the symptoms that indicate the onset of disease problems are: Drop in egg production and feed consumption: increased morbidity and mortality: inactivity and lack of vigour: droopy ruffled appearance and respiratory distress. Look for any sudden change in egg quality.

11. Sanitation

Sanitary measures are of vital importance in poultry operation. Keep roundworms, tapeworms and caecal worms under control. External parasites are a serious farm

hazard, and can reduce production if unchecked. Deworming at regular intervals should be practised.

12. Egg Quality

Respiratory and intestinal diseases should be kept under control for the maintenance of quality of egg shells. Indiscriminate use of sulpha drugs can affect the egg shell quality. The use of tetracycline can, however, improve it.

13. Records

A daily record of feed consumption, egg production, mortality, income and expenditure is essential to help improve farming efficiency and pinpoint troubles and their solutions.

14. Routine Checking

Critical items of management should be listed on a daily, weekly or seasonal check list. Every item must be checked. It helps to locate the cause of trouble when it occurs. Routine checks are: Cleaning and refilling of waterers and feeders: cleaning the house and spraying insecticide; stirring the litter; dusting; culling of birds; egg collection, etc.

Chapter- 7

IMPORTANT INDIGENOUS AND EXOTIC BREED OF CATTLE, BUFFALOES, SHEEP AND GOAT

The indigenous (Zebu) cattle *(Bos indicus)* are characterized by a prominent hump, a long face, upright horns, drooping ears, dewlap and slender legs. The colour varies from white to grey and black. Zebus have relatively lower basal metabolic rate, better capacity for heat dissipation. Therefore, they easily adapt to tropical heat and develop resistance to diseases, especially the tick-borne disease. The domestication of Zebu cattle appears to have taken place in Afghanistan, Sind and Baluchistan before 4000 BC. The seals from Sivikotada in Gujarat and Kalibhangan in Rajasthan bear images of animal's favourite of Harappans (2200 BC to 1600 BC), which were found in Sind, Gujarat and Rajasthan. Zebu cattle, primarily Ongole, Gir and Tharparkar, have been used in subtemperate / subtropical regions, such as southern United States, South America and Australia.

Classification and description of Cattle Breeds

Presently, Indian cattle are classified into 30 breeds, grouped under the following three categories:

(a) Milch breeds: Gir, Rathi, Red Sindhi, Sahiwal and Tharparkar.

(b) Draught Breeds: Amritmahal, Bachaur, Bargur, Dangi, Kherigarh, Khillari, Krishna Valley, Kangayam, kenkatha, Hallikar, Nagori, Panwar, Punganur, Siri, Umblacheri and Vechur.

(c) Dual-purpose breeds: Deoni, Gaolao,Haryana, kankrej, Malvi, Mewati(kosi), Ongole and red Kandhari.

Cattle breeds:

- A **breed** is a specific group of domestic animals having homogeneous appearance, behavior, and other characteristics that distinguish it from other organisms of the same species and that were arrived at through selective breeding.
- Domestic cattle belong to the family Bovidae sub-family Bovinae
- Can be classified into *Bos taurus* and *Bos indicus*.
- They have 30 pairs of chromosomes
- European cattle *Bos taurus* were introduced in the tropics to be raised as pure-breds and crossbred with indigenous breeds.
- As a result of crossing of native cattle with European dairy breeds, large numbers of crossbreeds have been produced in various tropical countries, which are being used in selection programs. Zebu *Bos indicus* cattle were introduced into United States in the nineteenth century for crossbreeding with European breeds.

On the basis of type Zebu cattle of India and Pakistan can be classified into six groups

1.	First group (Lyre horned grey cattle)	White fore head Flat or dished face Prominent orbital arches	Kankrej , Malvi, Tharparpar, Kherigarh
2.	Second group (short horned)	short horn white or light grey in color coffin shaped skull	Hariana, mewati, Ongole, Nagpuri, Rathi, Gaolao, Krishna valley
3.	Third group (curled horn)	Ponderous in body built Pendulous dewlap and sheath Prominent fore head Usually spotted either red or white shades	Gir, Sahiwal, Red Shindhi, Deoni, Nimari, Dangi
4.	Fourth group (Mysore type cattle)	Medium sized animal Having powerful quarter and tight sheath Prominent fore head, emerging horn from top of poll	Amrit mahal, Hallikar, Kangayam, Khillari and Bargur
5.	Fifth group (hilly tract)	Heterogeneous mixture Either short horned or slightly lyre horned Small black, red or dun often with large patches	Ponwar Siri
6.	Sixth group	Animals which can not fit in any of the above groups.	Dhanni , presently in Pakistan

On the basis of utility cattle breeds can be classified into three groups		
1. Milch breed	**2. Dual purpose breed**	**3. Draught purpose breed**
Cows - high yielder	Cows - fair yielder	Cows – low/poor yielder
Milk production-: 1500-2500	Milk production-: 1200-1500	Milk production -: < 800
1. Gir 2. Sahiwal 3. Red shindhi 4. Deoni	5. Hariana 6. Kankrej 7. Tharparkar 8. Nimari 9. Dangi 10. Mewati 11. Rathi 12. ongole	13. Amritmahal 14. Bargur 15. Bachaur 16. Gaolao 17. Hallikar 18. Khillari 19. Kangayam 20. Malvi 21. Kenkatha 22. Nagauri 23. Kherigarh 24. Siri 25. Ponwar 26. Krishna-valley

Exotic breeds of cattle

- Jersey : England
- Holstein Friesian (H.F) ; Holland
- Brown swiss ; Switzerland
- Guernsey ; France

Cross breeds of cattle

- ***Taylor–*** : (Short horn× local breed) *(1st cross breed cattle in India)*
- ***Karan-swiss*** : (Brown swiss × Sahiwal)
- ***Karan-fries*** : (H.F× Tharparkar)
- ***Jersindh*** : (Jersey × Red sindhi)
- ***Sunandini*** : (Brown swiss × local breed)
- ***Frieswal*** : (H.F× Sahiwal)
- ***Jamaica Hope (JH)*** : (Jersey × Sahiwal × H.F)

Buffalo Breeds:

Murrah has been used mainly for grading low-milk producing breeds throughout India and in some other countries of Asia and Europe. Breeds like Mehsana and Godavari have been developed through grading of Surti and non-descript buffaloes with Murrah in Gujarat and coastal Andhra Pradesh, respectively.

Classification and description

Domesticated buffaloes are classified into two main categories, viz. the **swamp buffalo** and the **river buffalo**. They belong to the same species but have different nature. The swamp buffalo is, more or less, a permanent denizen of marshy lands, where it wallows in mud and feeds on coarse marsh grass. It is found principally in parts of Assam and Tamil Nadu. This type comprises Nagpuri, Pandurpuri, Toda and Marathwada.

The river buffalo is found where clean water of rivers, irrigation canals and ponds is available to wallow. This type was specially developed for milk production with high fat percentage. These buffaloes are docile. Important breeds of milch buffalo, viz.

Murrah, Nili-Ravi, Surti, Mehsana, Jaffarabadi and Bhadawari, belong to this category.

The river buffaloes can be grouped under the following heads;

(a) Superior milch breeds (Average milk production more than 1,500 kg/lactation) - Murrah, Nili Ravi, Surti and Mehsana.

(b) Average milch breeds (Average milk production 500-1,000 kg/ lactation) Jaffarabadi,

Nagpuri and Bhadawari.

(c) Draught breeds (Average milk production less than 500 kg/lactation) Toda.

Domestic or water buffalo (*Bubalus bubalis*)

The water buffalo can be classified as **river** and **swamp type**.

1. **Murrah**,
2. **Nili-Ravi**,
3. **Surti**,
4. **Jaffarabadi**
5. **Bhadawari**
6. **Mehsana**
7. **Godawari**

<u>Indian sheep breeds</u> – 40 (Forty)

Domestic sheep belong to phylum *chordate,* class *Mammalia*, family *Bovidae*, genus *Ovis* and species *Ovis aries*. India rank sixth among the countries of the world

in respect to sheep population. The country has now about 71.55 million sheep by 2012.

Sheep breeds in different agro-ecological regions

Northern temperate		**North-Western Arid & semi-arid**		**Southern**		**Eastern**	
Breed	**Home tract**	**Breed**	**Home tract**	**Breed**	**Home tract**	**Breed**	**Home tract**
Gaddi	J&K HP	Chokla	Rajasthan	Deccani	AP MahKar	Chotanagpur	Bihar, WB
Bhakarwal	Kashmir	Nali	Rajasthan	Nellore	AP	Balangar	Orissa
Changthangi	Kashmir	Magra	Rajasthan	Bellary	Karnataka	Ganjam	Orissa
Rampur-Bushair	HP &UP	Marwari	Rajasthan	Hassan	Karnataka	Tibetan sheep	Arun. Predesh
Karnah	Kashmir	Pugal	Rajasthan	Mandya	Karnataka	Bonpala	Sikkim
Kashmir-merino	Kashmir	Malpura	Rajasthan	Mecheri	TN	Sahabadi	Bihar
Poonchi	Kashmir	Sonadi	Rajasthan	Kilakarsal	TN		
Gurez	Kashmir	Pattanwadi	Gujarat	Vembur	TN		
		Muzaffarnagari		Coimbatore	TN, Kerala, Karnataka		
		Jalauni	UP	Nilgiri	TN		
		Hissardale	UP	Ramanand white	TN		
		Jaisalmeri	Rajasthan	Madras red	TN		
				Tirchy black	TN		
				Kenguri	Karnataka		

Classification of sheep breed based on utility

	Type of wool			
	Apparel wool	**Carpet wool**	**Meat & carpet wool**	**Meat**

BREEDS	Hissardale	Chokla	Deccani	Madras red
	Avivastra	Nali	Ganjam	Mandya
	Bharat merino	Magra	Sahabadi	Mechery
	Kashmir-merino	Gaddi	Marwari	Vembur
	Nilgiri	Bhakarwal	Jaisalmeri	Ramnad white
		Avikalin		

Exotic Breeds of Sheep

Over the years, many exotic breeds of sheep of fine wool, mutton, dual-purpose and pelt have been introduced in India for improving/grading-up indigenous sheep.

S.No.	Sheep breed	Imported from	Purpose
1.	Merino	Spain/USSR	Fine wool breed
2.	Rambouillet	USA/France	
3.	Suffolk	England	Meat breed
4.	Dorset	England	
5.	Southdown	England	
6.	Corriedale	Australia	Dual Purpose

Indian Goat breeds

The goat was earliest ruminant domesticated around 900 to 7000 .C. Goat is a hollow horned ruminant belonging to order Artiodactyla, Family Bovidae and genera Capara. To-day India rank first for its genetic resources and numerical superiority of goat in the world. A goat produces per year around 130 kg of dry manure which improves the soil fertility through its nutrients.

Perhaps the first successful attempt of standardization of a breed was done for Angora goat, originated in central Asia (Turkey). The breed is exceptionally valued for mohair (soft white wool). Another creation of a breed "***Cashmere"*** has also originated in central Asia (India) at its high altitude for its production of ***Pashmina*** (fine soft wool), which is when blended with wool, it is known as felt.

Breed characteristics of Goat: *Jamunapari*

- Jamunapari breeds are found mainly in the state of Uttar Pradesh.
- Its coat colour is white with tan or black markings at neck and ears
- They are beard in both sexes; have tuft of long hairs in the buttocks.
- It is largest and most elegant of the long-legged goats of India.
- It has pronounced ***Roman nose*** having a tuft of hair which results in ***parrot mouth*** appearance.
- Their horns are short and flat and horizontally twisting backward.
- An adult male ranges from 90 to 100 cm in height, whereas a female goat ranges from 70 to 80 cm in height.
- It is, tall and leggy with convex face line and large folded pendulous ears.

- Generally found in white colors.
- Their ears are large and drooped downwards.
- An adult female weighs between 45kgs to 60kgs, whereas an adult male ranges between 65kgs to 80kgs.
- Average birth weight is up to 4 kg.
- Average age at first kidding is 20-25 months.
- They have large udder and big teats and average yield is 280 kg / 274 days.
- Have the ability to yield 2 to 2.5kgs of milk per day.
- The fat content of the milk ranges between 3 to 3.5%.
- They thrive best under range conditions with plenty of shrubs for browsing.

Indian Goats Breeds – 20 (Twenty)

Northern-temperate	**North-Western Arid & Semi-arid**	**Southern**	**Eastern**
Gaddi Changthangi Chegu	Sirohi, Marwari, Jhakhrana, Beetal, Barbari, Jamunapari, Mehsana, Gohilwadi, Zalawadi, Surti	Sangamneri Osmanabadi Kanni-Adu Malabari	Ganjam Bengal

Dual purpose breeds of Goat: ***Jamunapari, Sirohi, Barbari, Beetal, Jhakhrana.***
Exotic breeds of Goat: ***Alpine, Anglo-Nubian, Toggenberg, Sannen***

Breeds of poultry
Birds/Poultry/Fowl/Chicken/Broiler/Kukkut

India has made considerable progress in broiler production in the last two decades. Among the various Agricultural and Animal Husbandry enterprises Poultry farming has made rapid strides with an annual output of 41.06 billion eggs and 1000 million broilers, India ranks fourth largest producer of eggs and fifth largest producer of poultry broiler in the world. Among the various species of domestic poultry, the chicken is economically sustainable because of its adaptability under various agro climatic conditions.

Class: means a group of birds developed in a particular region. E.g. Asiatic, Mediterranean, American, English etc.

Breed: A group of birds/animals having similar shape, body weight and other characteristics.

Classification of Breeds of Poultry

1. American Class

These are medium to heavy sized birds, mostly meant for meat or brown egg production having clean yellow shanks and yellow skin. E.g. New Hampshire, white Plymouth Rock, Rhode Island Red, Wyandotte.

2. Mediterranean Class:

Small sized, egg type, broody birds with white earlobes, yellow or white skin, clean and yellow/slate colored shank and lay white shelled eggs. They are light bodied and well developed for high egg production. E.g. Leghorn, Minorca, Ancona

3. English Class

Medium to large sized birds, single comb, and red ear lobes mostly utility breeds noted for their excellent flushing properties. E.g. Australorp, Cornish, Sussex, Orphington

4. Asiatic Class

They are large bodied with heavy bones feathered shanks and poor layers broody with motherly instinct, red earlobes varying comb patterns, lay brown shelled egg, mostly feathered yellow shank and yellowish skin. E.g. Brahma, Cochin.

- **Indian Breeds**

The common control hen, the desi, is as a rule the best mother for hatching. She is a good forager. The Indian birds are mostly non-descripts, and are of very little value as layers. They have several local breed names such as Tenis, Naked Neck, Punjab, Brown, Ghagus, Lolab, Kashmir Faberella, Tilri, Busra, Telllicherry, Danki, Nicorai and Kalahasti. The pure breeds Karaknath and the Busra. The last occurs in western India.

E.g. Aseel (Fighting purpose), Chittagong, Kadacknath (Flesh is black in colour) Bursa

Commercial Broiler strains

E.g. Cobb, Hubbard, Lohman, Anak 2000, Avian -34, Starbra, Sam rat etc.,

Commercial Layer Strains

Eg.BV-300, Bowans, Hyline, H & N nick, Dekalb Lohman etc.

Broiler: Broiler is young chicken of either sex, which is reared primarily for meat purposes and marketed at an age of 6-8 weeks

Grower: The management of birds during 9-20 weeks or to the point of laying is referred to as grower period.

Layer: The management of birds during 21-72 weeks of age for the purpose of laying eggs (egg production).

Classification of poultry based on utility

1. Meat type : Cornish
2. Egg type : Leghorn
3. Dual purpose: RIR
4. Game type : Aseel
5. Fancy type : Bantam
6. Desi type : Kadaknath , Brahma

SWINE BREEDS

Indigenous domesticated pigs have no distinct breed features. Therefore, characteristics vary with topography and climatic conditions from region to region. These are raised traditionally by weaker society. However, some pig breeds have been evolved like Desi, Ghori and Ankamali.

The desi pig (Country Hog) which have been evolved from gradual domestication of wild pig (*Sus crofa cristatus*) are small sized pigs with a body weight of 40-80 kg and are found in UP, Bihar, MP and Punjab.

Breed	Native place	Identification	Mature body
1. Large White Yorkshire	England	It is a large sized and most extensively used exotic pig breed in India. Their body is solid white colored with erect ears, dished face and snout of medium lengths. *Large White Yorkshire is an excellent pig breed for the purpose of cross breeding.*	Boar(male pig) 300 to 400 kg and Sow around 230 to 320 kg.
2.Middle White Yorkshire	England	Short head and neck, jaw straight and light, white in colour, fine skin, medium sized, smooth skin and small bones.	Boar 250 to 340 kg and Sow 180 to 270 kg.
3. Landrace	Switzerland	Longer snout, drooping ears, medium sized, straight face and short legs. Lean carcass, white in colour with black skin spot, longer body and skin without wrinkles.	Boar 300 to 350 kg and Sow 200 to 250 kg.
4. Berkshire	England	Short unturned nose, dished face, erect ears, inclined forward, medium sized, black in colour, good width and broad back.	Boar 270 to 220 kg and Sow 200 to 295 kg. Meat is of good quality.
5. Hampshire	USA	Head and tail are black, erect ears, black hog, short legs and smaller breeds	Boar 250 to 320 kg and Sow 200 to 270 kg.
6.Tamworth	U.K	Longer head, long snout, golden brown in colour, thin shoulders, storng back.	Boar 200 to 320 kg and Sow 180 to 280 kg.
7. T & D (Tamworth × Desi)	JH, India	Black colour, Lustrous skin, Faster growth, Ability to utilize agricultural by-products and waste materials	Boar 90 to 120 kg and Sow 70 to 100 kg.

Ghungroo pig

This ***breed***/strain produces high quality ***pork*** utilizing agricultural by products and kitchen wastes. Ghungroo are mostly black coloured with typical Bull dog face

Other Breeds: Along with the above breeds, there are other pig breeds too. According to the weather of India some other breeds are suitable for farming. Hampshire, HS X1, Duroc, Indegenous, Ghungroo etc. are suitable for pig farming in India. But Large White Yorkshire, Landrace and Middle White Yorkshire are very suitable for commercial production.

Chapter-8

IMPROVEMENT OF FARM ANIMALS AND POULTRY

In last 40-50 years, many development programmes have been taken up by the central and state Governments under the five year development plans. Impressive work has been done under the guidance of the National Dairy Development Board under " Operation Flood " programmes for organizing dairy production, processing. With an estimated 86.8 million tons of annual milk production from animals managed by nearly 70 million farmers, India is the top-most milk producing country in the world. The average annual growth is about 5.6%. The per capita milk availability is about 214 grams per day as against the recommended requirement of 250 grams. Milk is one of the most important items of common vegetarian diet of Indian people. With rapid industrialization, economic growth and 250 million potential economically strong domestic consumers of milk and milk products, there is a very strong potential for future growth of the industry.

The major thrust areas in the current Five Year Development Plan and the new livestock development policy laid by the Government include the following:-

- Effective animal health and management, including control and eradication of important animal diseases and "Animal Disease information Service" for farmers
- Providing better quality Artificial Insemination service for breeding of animals
- Support for activities under "Operation flood (milk) programme", including strengthening of existing viable dairies and rehabilitation of sick dairies.
- Special integrated Dairy Development Projects for hilly and backward districts.
- Improving data-base on production of milk and reproduction capacity per animal to facilitate better planning and forecasting of issues and activities.
- Intensified research on milk products with particular emphasis on "Indigenous milk products" and with particular reference to products suitable for the utilization of buffalo milk.
- Encouraging milk production through commercial herds and for providing 'quality' milk for preparation of value-added products.
- Providing adequate credit for dairy sector
- Strengthening activities for fodder production.
- Formation of " Cattle breeders' Associations " and state "Livestock Development Boards"

I) Intensive Cattle Development Projects

Intensive Cattle Development Project is an integrated scheme with specific objective of stepping up overall milk production in a particular area to a targeted level within a specific period by improving the quality of the cattle through selective crossbreeding. The project normally covers a population of about a lakh of breedable cows and simultaneously attends to all aspects of cattle development such as controlled breeding, fodder development, balanced feeding practices and effective diseasecontrol.

Present scenario:

Some important issues of the Dairy industry are as under:-

Breeding of animals

- A new breeding programme - "National Cattle and Buffalo breeding programme" has been taken by the Government of India with massive financial assistance to the state Livestock Development Boards).

- Since last several years, massive programmes have been taken up for cross-breeding of local Non-descript cattle mainly utilizing semen of two exotic breeds namely Holstein Friesian (for irrigated areas and for farmers with adequate fodder resources) and Jersey (for dry/hilly areas and farmers having low fodder resources). In case of buffaloes the programme is for upgrading of local buffaloes using semen of better dairy breeds like Murrah, Mehasana etc. It is observed that the overall field results of crossbreeding with artificial insemination (A.I.) are still not very satisfactory. For example data of 17 million inseminations done through a large network of about 43782 A.I. centers showed that the number of calves born was only 15% of A.I. done in the field. Only about 10% of the breedable buffaloes were covered by A.I., the rest being covered by natural insemination service from locally available bulls for whom correct pedigree history was not available. .
- Buffalo is the major contributor (52.3%) to India's milk production. Therefore more emphasis is required on buffalo's development.

Feed and fodder development:

- Almost 70% of arable land is dry or rain fed land having an erratic rainfall, and poor productivity of cereal grains resulting into low output of dry fodder.
- As a result of rising human population, there is a tremendous pressure on land for its utilization for construction of human housing, roads and industries.
- The land holdings per farmer -household are getting fragmented and reduced.
- As and when irrigation facilities are available, the farmers tend to take cash crops and value-added crops. The land for fodder cultivation and availability is a last priority.
- The cattle population and therefore the demand for fodder are increasing every year.
- All the above issues have adversely affected the fodder balance for milk production. There is tremendous overall shortage of fodder availability against the nutritional demand for dairy cattle. Pandey (1995) had estimated that by year 2002, the gap (demand minus availability) of fodder in India will be 606.2 million tons for dry fodder, 1018.0 tons of green fodder in Kharif (monsoon) season and 1174.36 tons of green fodder in Rabi (winter) season.

Dairy cattle health:

- The work of diagnosis and treatments mostly done by the State veterinary departments. They have well qualified technical manpower but lack financial resources.
- Most of the important vaccines and medicines are manufactured in the country. However there is a shortage of diagnostic agents.
- Where farmers have high producing dairy animals, they are willing to pay for the services and private veterinary practices are possible and flourishing. A good networking amongst the veterinary laboratories and teaching institutions.
- Almost every state has a state Agricultural University and a veterinary faculty.

Production and marketing of milk:

2. Most of the milk in India is produced in villages. Quantity of milk produced per household is very small.
3. About 56% of milk is available as marketable surplus for urban areas. Fairly large quantity of milk is converted to local milk products (khoa, paneer, butter, ghee etc).
4. The share of organized sector is small (private-11-12%, Government/cooperative sector - 11-12%).There is still a very large portion of milk market in the hands of unorganized sector which has adverse effect on the farm-gate price of the milk..
5. In Government/cooperative sector, almost 80% milk is marketed as liquid milk and only 20% as milk products. While it is reverse in the private sector - only 30% is marketed as liquid milk and 70% as milk products with value addition.
6. In absence of properly developed infrastructure for preservation of raw milk in local areas many plants in Govt. sector collect fresh raw milk from the far-flung rural areas (each producer having very small quantities) twice a day , send it over a long distance to towns for processing, incurring high cost on transportation. This erodes the profitability. As a result, many plants have become uneconomical, non-functional or they are working much below their potential capacities. Alternative strategies need to be developed to store raw milk in bulk coolers in the rural area and transport it in bigger volumes at longer intervals. There is also a need to use alternative and cheaper energy sources to store cool milk, and develop rural markets so that much of the milk produced in the rural areas finds consumption avenue in the nearby local markets
7. There is a need to set up schemes for diversification and preparation of value added milk products at the production centres instead of sending raw milk over long distances. Depending upon the market demand for a particular product, quantum of raw milk available , and financial position of the milk plant, suitable milk processing and product manufacturing units can be set up.
8. Suitable technologies and model projects for several dairy products have been developed by institutions like NDDB Anand , NDRI Karnal, NDRI Bangalore, CFTRI Mysore etc. .NABARD has prepared and circulated to banks suitable techno-economic model schemes

A. <u>Centrally-Sponsored Dairy Development Schemes</u>

- Dairy Entrepreneurship Development Scheme
- Intensive Dairy Development Programme

B. <u>Centrally-Sponsored Animal Husbandry Schemes</u>

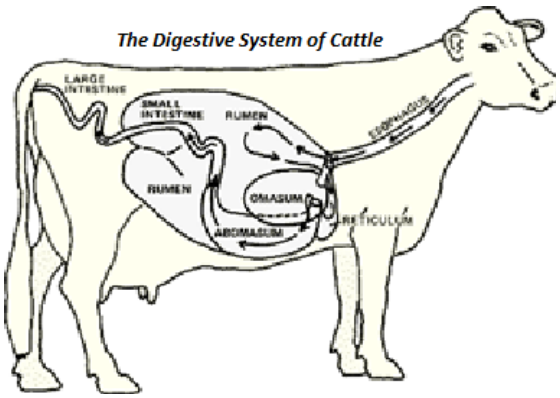
- Fodder and Feed Development Scheme
- Pig Development Scheme
- Poultry Venture Capital Fund
- Establishment and Modernization of Rural Slaughter Houses
- Salvaging and Rearing of Male Buffalo Calves
- Utilization of Fallen Animals
- Integrated Development of Small Ruminants (Sheep, Goat) and Rabbits
- Conservation of Threatened Breeds of Small Ruminants, Rabbits, Pigs, Pack Animals and Equines
- Livestock Insurance Scheme

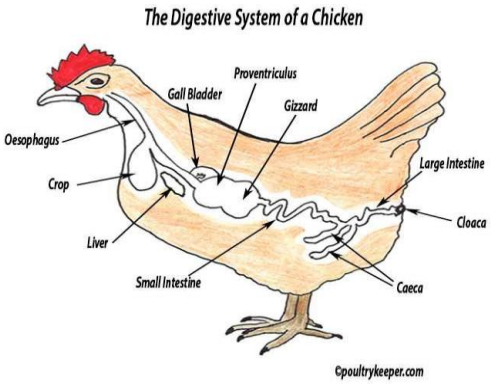
<u>Dairy Development</u>

- The turning point in India's dairy sector started in 1971 when the Government launched the Operation Flood Programme with the assistance of World Food Programme by providing assistance in the form of skimmed milk powder and butter oil. This programme was implemented in three phases -1971-81, 1981-87 and 1987-1996. By the end of third phase, about 72,700 dairy cooperative societies with 93 million farmer members were organised. In OF areas, the country has at present about 1 lac organized primary village dairy cooperatives with an aggregate membership of 1.1 crore producers. These primaries are federated into 170 district cooperative milk unions and further to state cooperative dairy federations. The dairy cooperative network collects about 170 lac kg per day (LKPD) and pays an aggregate amount of about Rs.7000 crores to the milk producers in a year. These cooperatives form part of the National Milk Grid which today links the milk producers throughout India with consumers in over 700 towns and cities bridging the gap between the seasonal and regional variation in the availability of milk while at the same time ensuring a remunerative price to the producers and a reasonable price for quality milk and milk products to the consumers. For the five years ending March, 2003, the average milk procurement by dairy cooperatives grew at 7.3% whereas the marketing of milk by cooperatives grew at 3.2%.
- Animal Husbandry sector plays an important role in the strengthening the economy of the state, especially rural economy. Besides, AH sector is providing employment opportunities to unemployed and underemployed rural poor. It is envisaged to achieve the increased production by designing genetically superior animals and is possible by

Chapter-9

DIGESTION IN LIVESTOCK AND POULTRY





The cow's digestive tract consists of the mouth, esophagus, a complex four-compartment stomach, small intestine and large intestine. The stomach includes the rumen or paunch, reticulum or "honeycomb," the omasum or "manyplies," and the abomasum or "true stomach."

The rumen. The rumen (on the left side of the animal) is the largest of four compartments and is divided into several sacs. It can hold 25 gallons or more of material, depending on the size of the cow. Because of its size, the rumen acts as a storage or holding vat for feed. It is also a fermentation vat. A microbial population in the rumen digests or ferments feed eaten by the animal. Conditions within the rumen favour the growth of microbes. The rumen absorbs most of the volatile fatty acids produced from fermentation of feedstuffs by rumen microbes.

The reticulum. The reticulum is a pouch-like structure in the forward area of the body cavity. The tissues are arranged in a network resembling a honeycomb. A small fold of tissue lies between the reticulum and the rumen, but the two are not actually separate compartments. Collectively they are called the rumino-reticulum.

The omasum. This globe-shaped structure contains leaves of tissue (like pages in a book). The omasum absorbs water and other substances from digestive contents.

The abomasum. This is the only compartment (also called the true stomach) with a glandular lining. Hydrochloric acid and digestive enzymes, needed for the breakdown of feeds, are secreted into the abomasum. The abomasum is comparable to the stomach of the non-ruminant.

The small intestine. The small intestine measures about 20 times the length of the animal. It is composed of three sections: the duodenum, jejunum, and ileum. The small intestine receives the secretions of the pancreas and the gallbladder, which aid digestion. Most of the digestive process is completed here, and many nutrients are absorbed through the villi (small finger-like projections) into the blood and lymphatic systems.

Cecum. The cecum is the large area located at the junction of the small and large intestine, where some previously undigested fibre may be broken down. The exact significance of the cecum has not been established.

Large intestine. This is the last segment of the tract through which undigested feedstuffs pass. Some bacterial digestion of undigested feed occurs, but absorption of water is the primary digestive activity occurring in the large intestine.

Function of the Digestive Tract

Eructation (belching). Large quantities of gas, mostly carbon dioxide and methane, are produced in the rumen. Production amounts to 25 to 50 litres per hour and must be removed; otherwise bloating occurs. Under normal conditions, distension from gas formation causes the cow to belch and eliminate the gas.

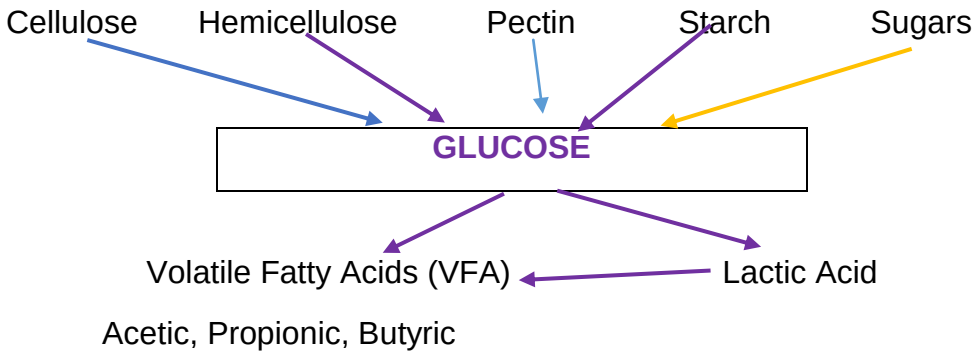
Rumination. A cow may spend as much as 35 to 40 percent of each day ruminating (cud chewing). The actual amount of time spent ruminating varies from very little (when grain or finely ground rations are fed) to several hours (when long hay is fed). Mature cattle spend little time chewing when eating. During rest periods, feed boluses (cud) are regurgitated for rechewing to reduce particle size and for resalivation. Feed is more readily digested by rumen microbes as particle size is reduced.

Motility of the rumen and reticulum. The rumen is always contracting and moving. Healthy cows will have one to two rumen contractions per minute. The contractions mix the rumen contents, bring microbes in contact with new feedstuffs, reduce flotation of solids, and move materials out of the rumen. Lack of or a decrease in frequency of rumen movements is one way of diagnosing sick animals.

Saliva production. As much as 60 to 70 litres of saliva can be produced by salivary glands and added to the rumen each day. Saliva provides liquid for the microbial population, recirculates nitrogen and minerals, and buffers the rumen. Saliva is the major buffer for helping to maintain a rumen pH between 6.2 and 6.8 for optimum digestion of forages and feedstuffs.

Vomiting. Cattle rarely vomit. Occasionally certain feeds will induce vomiting. Some pasture plants, usually weeds, contain alkaloids that can cause this problem. Should this condition persist, a veterinarian should be consulted.

Microbial digestion of feed carbohydrate in the rumen



Digestion of energy feeds in the rumen. Simple and complex carbohydrates (fibre) are digested by rumen microbes and converted into volatile fatty acids. The volatile fatty acids, which consist mainly of acetic, propionic, and butyric acids, are the primary energy source for ruminants. When large amounts of forage are fed, the formation of acetic acid predominates (60 to 70 percent of total) with lesser amounts of propionic (15 to 20 percent) and butyric (5 to 15 percent) acids occurring. However, when grain feeding is increased or when finely ground forages are fed, the proportion of acetic acid may decrease to 40 percent, while the amount of propionic

acid may increase to 40 percent. Such a change in volatile fatty acid production generally is associated with a reduction in milk fat test.

Approximately 30 to 50 percent of the cellulose and hemicellulose is digested in the rumen by the microbial population. Sixty percent or more of the starch is degraded, depending on the amount fed and how fast ingested materials move through the rumen. Most sugars are 100 percent digested within the rumen.

The volatile fatty acids are absorbed from the rumen into the blood stream and transported to body tissues, including the udder, where they are used as sources of energy for maintenance, growth, reproduction, and milk production. The cow derives 50 to 70 percent of its energy from the volatile fatty acids produced in the rumen.

Protein and non-protein nitrogen utilization in the rumen. Some of the protein consumed by the cow escapes breakdown in the rumen. Protein undergoing fermentation is converted to ammonia, organic acids, amino acids, and other products. Approximately 40 to 75 percent of the natural protein in feed is broken down. The extent of breakdown depends on many factors including solubility of the protein, resistance to breakdown, rate of feed passage through the rumen, and others. Many rumen micro-organisms require ammonia (breakdown product of protein) for growth and synthesis of microbial protein. Ammonia also may be provided from NPN sources such as urea, ammonium salts, nitrates, and other compounds. Rumen microbes convert the ammonia and organic acids into amino acids that are assembled into microbial protein. Excess ammonia is mostly absorbed from the rumen into the blood stream, but small amounts may pass into the lower digestive tract and be absorbed. Feed protein (that escapes breakdown in the rumen) and microbial protein pass to the abomasum and small intestine for digestion and absorption.

Vitamin synthesis. The rumen micro-organisms manufacture all of the B vitamins and vitamin K. Vitamin synthesis in the rumen is sufficient for growth and maintenance. Under most conditions, cattle with functioning rumens do not require supplemental B vitamins or vitamin K in the diet. Niacin (B3) and thiamine (B1) may be needed under stress conditions.

Fat digestion. Most of the digestion and absorption of fat occurs in the small intestine. Rumen micro-organisms change unsaturated fatty acids to saturated acids through the addition of hydrogen molecules. Thus, more saturated fat is absorbed by cows than by simple-stomach animals. Feeding large quantities of unsaturated fatty acids can be toxic to rumen bacteria, depress fibre digestion, and lower rumen pH.

Digestive System of Calf

At birth and during the first few weeks of life, the rumen, reticulum, and omasum are undeveloped. In contrast to the mature cow, in the calf, the abomasum is the largest compartment of the stomach. At this stage of life, the rumen is non-functional and some feeds digested by the adult cannot be used by the calf. During nursing or feeding from a bucket, milk bypasses the rumen via the oesophageal groove and passes directly into the abomasum. Reflex action closes the groove to form a tube-like structure which prevents milk or milk replacer from entering the rumen. When milk is consumed very rapidly, some may overflow into the rumen.

Development of rumen begins at the age of 3-4 weeks and will begin functioning like the adult's when the calf is about 3 months of age.

Chapter -10

CLASSIFICATION OF FEEDSTUFFS

Any material fed to animal for providing nourishment is Feedstuff. Many types of feed ingredients or feedstuffs are available to supply the nutritional needs of livestock. These feedstuffs are the raw materials that are converted into animal cells, tissues, organs, and products. A familiarity with the chemical and nutritional composition of the various classes of feedstuffs is essential in order to formulate the most economical and profitable rations. It is also important to be familiar with the various feedstuff types to plan for planting, harvesting, and storage of home grown feedstuffs. Proper preservation of stored feedstuffs is a critical profitability factor for some types of farms and ranches.

CLASSIFICATION OF FEEDSTUFFS

Feedstuffs generally are included in the ration to meet the requirement for one or more nutrients. However, they may also be included in the ration to provide bulk, reduce oxidation, emulsify fats, provide flavour, improve animal health, or improve characteristics of the products produced by livestock.

The various feedstuffs used in livestock feeding are broadly classified into following groups:

1. Roughage 2. Concentrates 3. Feed supplements 4. Feed additives

Roughage: roughages are the feedstuffs which contain more than 18% crude fibre and less than 60% TDN. Due to higher crude fibre content they are more bulky and have low digestibility as compared to concentrates.

Roughages are classified as –

1. Succulent/Green Roughage: they contain about 60-90% moisture. e.g., Pasture, Cultivated fodder, Tree leaves, Root corps and Silage.
2. Dry roughage: they contain about 10-15% moisture. e.g., Straw, Hay and Kadbi.

Pasture:-

1. It includes various grasses and shrubs grown naturally on land reserved or meant for grazing of livestock.
2. It is most convenient and economic feed for the animals.
3. Young green grasses are digestible and palatable
4. Its digestibility decrease with maturity due to increasing lignification.
5. Young grasses or pasture contain more proteins and carotenes.
6. The CP may vary between 3-13% while CF varies between 20-40%.
7. Grass proteins are rich in amino acids like arginine and glutamic acids.
8. Some grasses also contains unidentified growth factors.

Cultivated fodders:

- These includes specially cultivated fodders for feeding the animals in order to provide good quality fodder throughout the year. These are classified into two groups.-
- Leguminous fodders:-

- They consists of stem and leaves of a plant belonging to leguminous family. e.g., Lucerne, Berseem, Cowpea.
- They fix atmospheric nitrogen due to presence of *Rhizobium* bacteria in their root nodules and hence have higher nitrogen content.
- They are rich in Protein and therefore form good source of protein.
- They are rich in calcium.
- Lucerne and Berseem must be fed along with dry fodder to avoid risk of bloat.
- They are also high in vitamins like Vit.A and Vit.D.
- They are more palatable.

Non-Leguminous Fodder

They include:

a. Cereal fodder crop- Maize, Sorghum, Bajra
b. Cultivated grasses- Para grass, Guinea grass, Napier grass, Anjan, Doob, Marbvel.

- They are low in protein content.
- They have low mineral content.
- They are low in vitamin content.
- They are less palatable.
- Maize is an ideal cereal fodder for cattle because of its high palatability, nutritive value, and hence heavy yield potential. It is also called as king of Fodders.
- Sorghum is a hardy cereal fodder well adopted to tropical climate.
- Oat is an important temperate fodder crop.

Tree leaves:-

- Commonly used for feeding of sheep and goat.
- During scarcity of fodder also used for feeding Dairy cattle and buffalo.
- Young tender tree leaves are good in protein content and low in fibre.
- CF content increases while CP content decreases with the maturity.
- Usually rich in calcium but poor in phosphorus.
- Example- Babul, Jharberi, Pipal, Bel, Subabul.

Root crops:-

- They have higher moisture content i.e. between 75-90%
- Their CF content is low (5-12%) and present in most digestible form.
- Example-Tapioca, Fodder BEET AND Carrot.

Silage:

- Silage is the feedstuff obtained after controlled anaerobic fermentation of succulent fodders.
- Usually silage is prepared from green cereal crops like maize, jowar and bajra.
- Silage can also be made from legume fodder and grasses.
- The grass silage is less nutritive than legume silage.

Importance of feeding green fodder-

- Keeps the animal in good health and improve reproductive efficiency.
- Palatable and easy for digestion.
- Have cooling effect on body.

- Mild laxative and hence prevent constipation.
- Rich in carotenes. (Precursor of Vit. A)
- Wastage is minimum because liked by animals.
- Provides soluble sugars like glucose, fructose, and sucrose.
- Provides amino acids like arginine and glutamic acids.
- Contains unidentified growth factors that favours the growth of animals.
- Satisfies the appetite.
- Legume fodder like Lucerne and berseem provides good amount of proteins and essential minerals.
- Feeding of green fodder alone can sustain about 10 lit. of milk production per day with an average 20% saving on feed cost..
- Economical source of nutrient for animal body.
- Gives long life to animals and thereby longer production period.
- Provides fresh nutrients in their natural form.

Dry roughages

1. **Straw:** plant residue including stem and leaves after removal of the seeds or grains after maturity.

Rich in fibre content.

Have low digestibility due to higher lignin content.

Poor nutritive value.

Low in protein, minerals, vitamins and energy.

Two types- **A. Cereal straw-** *Wheat and paddy straw
*Less palatable-CP: 1-2%, TDN-40%
*Poor in phosphorus and rich in silica.
*Rich in oxalic acid and reduces calcium absorption in body

B. Legume straw- ***Udid straw, groundnut straw and moong straw.
*Palatable and nutritious than cereal straw
*DCP content 2-3%

2. Hay: *Preserved fodder having moisture content of 15-20%
*Rich in carotene and Vit.D
*Generally prepared from plants having this stem
*Example-legume hay and grass hay

3. Kabdi *Dried mature fodder obtained from Jowar, Bajra without grains

Feedstuffs

1. Concentrates		2. Carbonaceous roughages	
a) Animal origin	b.)Plant origin	a.)Animal origin	b.)Plant origin

a. Animal tissue
b. Fish products
c. Milk products

Characteristics of Common Concentrate Feedstuffs

A. Carbonaceous concentrates (high-energy feeds; mostly feed grains and their by-products. According to NRC nomenclature, these are products containing less than 20% protein and less than 18% fibre.)

Important concentrates feeds are:
a. Corn-most popular and most widely fed
b. Sorghum grains-(milo, kafir, hybrids, etc.)
c. Oats-(65-70% TDN; 12% CP)
d. Barley-(70-75% TDN; 11-12% CP)
e. Rye-(75% TDN; 12% CP)
f. Wheat-(80% TDN; 12-14% CP)
i. Molasses-must contain over 48% sugar (55-75% TDN)
1. General nutritive characteristics
a. High in energy (TDN or NE)
b. Low in fibre
c. Low in protein (in relation to oil seeds and some mill feeds)
d. Protein quality is variable and generally quite low
e. Mineral level
f. Vitamin levels

Chapter-11

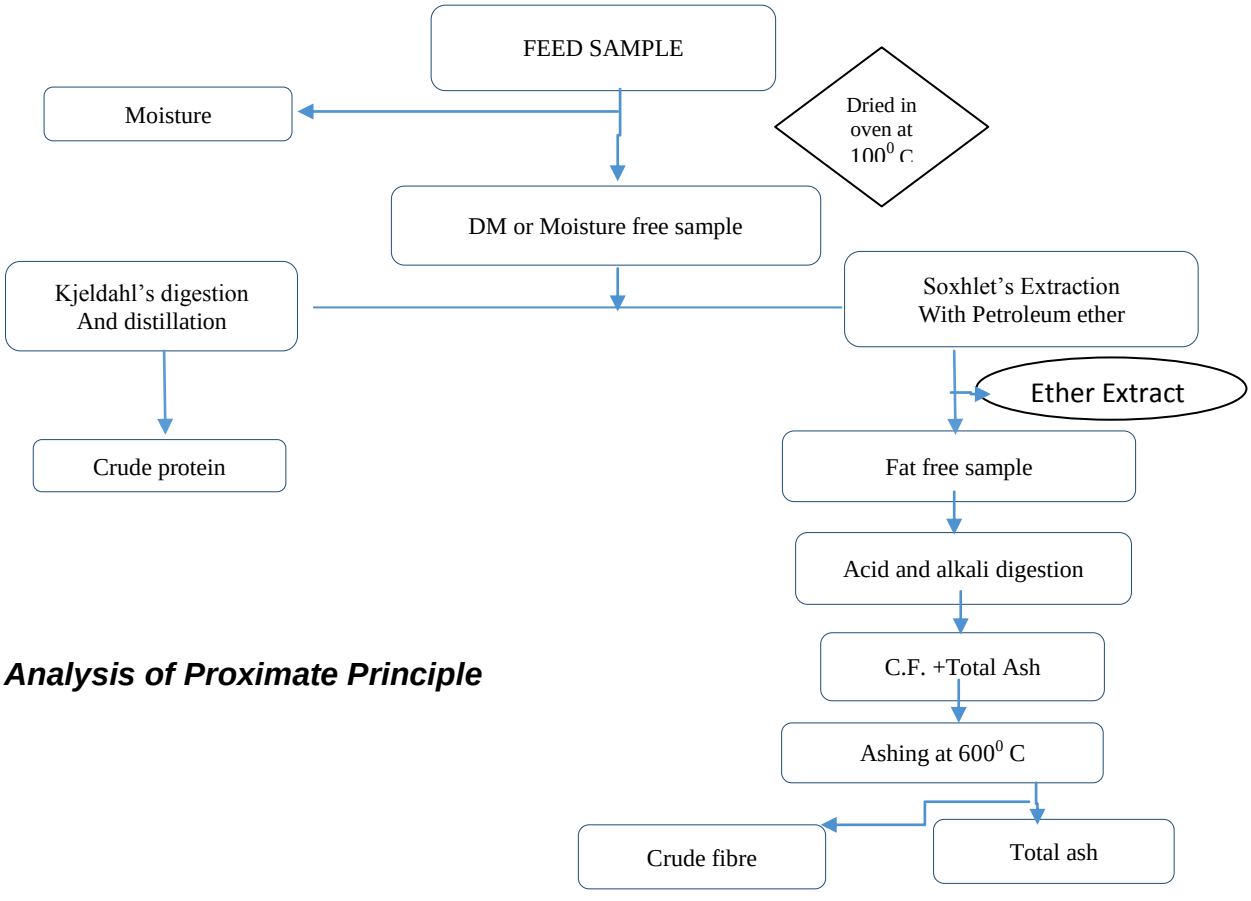
PROXIMATE PRINCIPLES OF FEED

A method for the quantitative analysis of the different macronutrients in feed is the Weende or proximate analysis, based on the Weende analysis that was developed in 1860 by Henneberg and Stohmann in Germany.Proximate Analysis is a partitioning of compounds in a feed into six categories based on the chemical properties of the compounds. The six categories are:

1. Moisture
2. Crude protein (CP)
3. Crude fibre
4. Nitrogen-free extracts (NFE, digestible carbohydrates)
5. Ether extract
6. Total Ash

Moisture: It represents the water content of feedstuff. The portion of feedstuff other than moisture is called as dry matter (DM).
Crude protein (CP): It represents the total amount of Protein in the feedstuff. The crude protein include true protein as well as non-protein nitrogenous substance like urea, biuret, and amides. Crude protein is determined by measuring the nitrogen content of the feed and multiplying it by a factor of 6.25. This factor is based on the fact that most protein contains 16% nitrogen. Crude protein is determined by kjeldahl method. The method involves: Digestion, Distillation and Titration.
Crude fibre: it includes less digestible carbohydrates like pectins, cellulose, and hemicellulose and non-carbohydrate fraction like lignin.
Nitrogen-free extracts (NFE): It includes more digestible carbohydrates like starch sugars and also cellulose and hemicellulose in minor quantity.
Ether extract: it represents liquid portion of feedstuff. Thus it contains fats, fatty acids, pigments, waxes etc.
Total Ash: It represents inorganic portion of feedstuff like minerals and silica.

Analysis of Proximate Principle



Chapter -12

NUTRIENTS AND THEIR FUNCTIONS

Animal ***feed*** is food given to domestic animals in the course of animal husbandry. There are two basic types, ***fodder*** and ***forage*.** A nutrient is defined as "Any feed constituent or group of feed constituents of the **same general chemical composition** that **aids in support of animal life**." Commonly used feed ingredients may vary considerably in the content of the six basic nutrients. Many (most) feedstuffs or ingredients in a ration contain more than one of the six basic nutrients.

Six Classes of Nutrients

1. Water
   - **The Most Critical Nutrient!**
   - Functions in transport, chemical reactions, temperature maintenance, lubrication, etc.
   - Water deprivation ---> dehydration ---> electrolyte imbalance ---> death
   - Requirements vary from one species to another. For example, the desert rat requires very little, while the dairy cow may require 50-70 litres/day.
   - Management problems leading to lack of water

2. Carbohydrates (CHO)
   - Functions
     - energy source
     - building block for other nutrients
     - dietary excess stored as fat
   - Two main components of carbohydrates
     - Crude fibre (cellulose mainly)
     - Nitrogen-free extract (soluble sugars, starches)
   - Differences between monogastric, hindgut fermenter and ruminant
     - Ruminants and hindgut fermenters have microorganisms in the rumen or hindgut that can break down crude fibre (cellulose) into useable products; monogastrics cannot utilize most crude fibre.
     - All livestock are capable of breaking down the soluble sugars and starches.
   - Management Problems
     - poor quality feedstuffs
     - improper ration balancing

3. Fats (lipids)
   - Functions
     - Energy (stored at higher conc./g than CHO)
     - Source of heat, insulation, body protection (cushioning)
     - Essential fatty acids (immune function, CLA-anticancer link?)
   - Sources
     - Oils (soybean oil, corn oil, fish oil)
     - By product fats (lard or tallow from livestock rendering)
       - provides cheap energy source
       - reduces dust in feed manufacturing and animal feeding
       - increases feed palatability

4. Proteins
   - Most expensive ingredient in ration, need decreases as animal matures
   - Source of Essential Amino Acids (number, type and level of amino acids required varies with animal species)

    - Functions -- basic structural unit, needed in metabolism, hormone, antibody and DNA production
- When fed in excess, converted to energy, fat
- Mono-gastric vs. ruminant
    - True protein is composed of amino acids
    - Crude protein contains both true protein and other nitrogenous products (non-protein nitrogen)
    - Non-protein nitrogen can be converted by rumen bacteria to true protein (cheaper source of protein for the ruminant animal)

5. Minerals
- Two classes
    - Major minerals -- Ca, P, Na, Cl, Mg, K, S
    - Minor (Trace minerals) -- Co, Cu, F, I, Fe, Mn, Mo, Se, Zn
        - The need for supplementation of minor minerals such as Se and F varies with the region
- Functions -- skeleton, protein synthesis, oxygen transport, fluid and acid-base balance in body, enzyme reactions
- Mineral/mineral and vitamin/mineral interactions
    - Ca - Vitamin D
    - P - Vitamin D
    - Co - Vitamin B12
    - Se - Vitamin E
- Both deficiencies and excesses can lead to disease

Trace minerals

Many elements are required in trace amounts, usually because they play a catalytic role in enzymes.[6] Some trace mineral elements (RDA < 200 mg/day) are, in alphabetical order:

- Cobalt required for biosynthesis of vitamin B12 family of coenzymes
- Copper required component of many redox enzymes, including cytochrome c oxidase
- Chromium required for sugar metabolism
- Iodine required not only for the biosynthesis of thyroxin, but probably, for other important organs as breast, stomach, salivary glands, thymus etc. (see Extra thyroidal iodine); for this reason iodine is needed in larger quantities than others in this list, and sometimes classified with the macro minerals
- Iron required for many enzymes, and for haemoglobin and some other proteins
- Manganese (processing of oxygen)
- Molybdenum required for xanthine oxidase and related oxidases
- Nickel present in urease

6. Vitamins
- Two classes
    - Water soluble -- B & C
    - Fat soluble -- A, D, E, K
- Functions -- most vitamins have multiple functions in body involving metabolism, enzyme reactions, etc.
- Requirements increase with age
- Both deficiencies and excesses lead to disease

In addition to meeting an animal's basic nutrient requirements, a diet must also meet the **"3 P's"** to be useful as a livestock feed.

- ***Palatable*** -- must be edible, accepted, and eaten by the animal
- ***Profitable*** -- if the livestock producer cannot make a profit feeding certain ingredients, he/she won't be in business very long. Approximately 75% of the out-of-pocket costs in livestock production is feed costs.
- ***Productive*** -- animals eating the diet must be productive. The **least cost ration** may just barely meet the animal's nutrient requirements, but not allow the animal to function at it's most productive level. The **Balance/optimal ration** is the ration that can be produced for the least cost for the benefit returned in animal performance (growth, productivity, longevity, reproductive performance, etc.)

- There are "linkages" or relationships between different basic nutrients.
  - Selenium (a mineral) is linked to Vitamin E; they share many "duties" in the body and one can often be substituted for the other.
  - Fats, carbohydrates and proteins can all be used to provide energy to the body and can be additive in meeting the energy requirements of an animal. (Protein will be converted to energy producing subunits if fed in excess of it's basic metabolic needs.)
  - Calcium and Phosphorus must be fed at the appropriate "ratio" for maximal utilization and to prevent interference with other mineral metabolism.
- No single feed ingredient can supply all 6 basic nutrients an animal needs to survive and be productive.
  - One must **"balance"** the ratio of different feed ingredients to meet the individual animal's needs.
  - The nutrient needs of an animal varies depending upon the species, age, stage of lifecycle, etc.
  -

Chapter-13

Feed Ingredients for Ration for Livestock and Poultry

Feed ingredients are broadly classified into cereal grains, protein meals, fats and oils, minerals, feed additives, and miscellaneous raw materials, such as roots and tubers.

Feed Ingredients

Conventional poultry rations usually include many cereals like maize, rice, wheat, oat, barley; and a few cereal byproducts such as wheat-bran or rice polish, animal and vegetable protein sources like fish-meal, meat-meal, soybean-oil-meal, groundnut-cake, etc. according to their availability. The whole ration is fortified with adequate minerals and vitamins either in chemically pure or through ingredients known to be rich in these nutrients. With the cost of feed soaring high and the availability of conventional ingredients becoming scarce, intensive and continuous efforts are being made to determine the nutritive value of agro industrial byproducts to replace more costly ingredients in poultry rations. The following are some of the common feedstuffs used for making poultry rations in this country.

Conventional Poultry Feeds

1. **Maize:** It is highly digestible and contains very little fiber. It is used as a source of energy and is low in protein, especially lysine, and sulphur-containing amino acids. The yellow varieties are a good source of vitamin A and xanthophylls. The latter is responsible for the yellow skin in certain breeds of fowl.
2. **Barley:** Barley is not very palatable because of its high fiber content and should not constitute more than 15 per cent of the ration.
3. **Oat:** Oat is not very palatable because of its high fiber content. It should not constitute more than 20 per cent of the ration. Because of its manganese content, it may help in preventing hock disorders, feather pulling and cannibalism.
4. **Wheat:** Wheat can be used for replacing maize as a source of energy.
5. **Wheat bran:** It is bulky and quite laxative on account of its high fiber, manganese and phosphorus content.
6. **Pearl millet:** This is a very useful feedstuff, similar to wheat in its nutritive value.
7. **Rice:** Broken grains of rice can be used for replacing maize.
8. **Rice polish:** This is a very good substitute for cereal grains and can be used up to 50 per cent of the ration. Because of the high oil content, it is likely to become rancid on storage under warm conditions.
9. **Deoiled rice polish:** Energy content of deoiled rice polish is low because of the removal of fat, but it is rich in protein and ash content.
10. **Sorghum:** The feeding value of sorghum is similar to that of maize. But it has higher protein content, quite palatable and maybe used in place of maize. Sorghum-meal is a good source of some amino acids, but costlier than other oilcakes.
11. **Groundnut-cake:** It is quite palatable and is widely used as a source of protein in poultry rations. It contains about 40 per cent protein.

12. **Fish-meal:** Fish-meal is one of the best poultry feedstuffs as a source of animal protein. Its composition varies widely depending upon whether it is made from whole bony fish or fish cannery scraps. Most Indian fish-meals contain 45 to 55 per cent protein. The presence of fish scales reduces its feeding value.
13. **Limestone:** Limestone is a source of calcium. It should not contain more than 5 per cent magnesium.
14. **Oyster-shell:** Oyster-shell contains more than 38 per cent calcium, and is a good substitute for limestone. It is quite palatable.

By-products used in animal feed

Forest produce Babul seed, dhaincha seed, puwad seed, patwa seed, sagaon seed, san seed, tulsi seed, tamarind seed, babul falli, mesta seed. Food industry Biscuit waste, cocoa-shell powder, cocoa beans, maize dust, macaroni waste. Gum and starch industry Guar seeds, guar kurma and chuni, dhaincha kurma, tapioca milk powder, tapioca spent pulp, maize gluten, maize cake. Fruit and vegetable processing Orange peel, spent lemon, orange waste, jamun seed, potato waste, tomato waste, mango kernel, pineapple waste, mango seed extraction, coffee waste, extracted tea leaves. Alcohol industry Barley waste, yeast sludge, grape extractions, penicillin residue. Essential oil industry Spent residue of pepper, cardamom and ginger, spent ajwan seed, spent anthia seed cake.

Most of these by-products are used in cattle feed. They are regional and seasonal and used, always fresh, in small quantities.

Table: Nutritive values of various livestock feedstuffs (on dry matter basis)

Types of feed	Name	DCP%	TDN%
1) Roughage			
A) Green fodders			
i)cereals	Jowar	3.44	54.03
	Maize	4.14	67.77
	Bajra	4.31	59.24
	Oat	7.10	69.70
	Lucerne	15.92	57.79
	Berseem	12.51	59.18
ii)Legumes	Cowpea	20.26	62.19
	Guinea grasses	5.83	65.09
	Para grasses	7.91	59.54
	Naiper (Gajraj)	3.85	55.39
	Jowar silage	2.40	51.10
	Maize silage	3.40	61.10
iii)Grasses	Oat silage	4.10	62.60
	Babul	5.7	62.3
	Sababul	15.0	57.0
iv) Silage	Khejri	8.8	48.7
	Vilayati Babul	9.0	47.0
	Neem	8.3	53.0
v) Tree leaves	Peepal	8.0	40.3
	Vad/bargad	2.0	44.5
	Anjan	2.0	47.7
	Ber	3.1	30.7
	Bamboo	9.3	48.8
	Bel	10.8	56.7
	Jhaberi	5.5	51.1
	Mahua	0.0	37.0
B) Dry Foodders	Jowar Kadbi	1.17	56.42
i)Kadbi	Bajra kadbi	0.93	53.45
ii) Hay	Lucerne hay	11.00	50.00
iii) Strws	Berseem hay	9.00	58.80
	Cowpea hay	9.50	45.00
	Rice straw	0.0	41.62
	Wheat straw	0.0	48.24
	Gram straws	2.41	37.08

II) Concentrates		**DCP%**	**TDN%**
A) Energy Rich i)Cereal grains	Maize	7.86	80.00
	Jowar	7.00	68.00
	Wheat	6.20	92.27
	Bajra	6.5	58.00
	Barley	7.27	74.60
	Oat	7.86	78.48
ii)Cereal byproducts	Wheat bran	11.00	67.00
	Rice bran	7.00	60.00
	Rice polish	12.00	67.00
B) Protein Rich i)Vegetable protein	Soyabean	37.44	87.80
	Arhar	14.35	74.05
	Gram	11.96	81.33
	Black gram	13.47	63.35
	Pulse chuni	12.00	68.00
	Gram husk	0.30	54.00
	Cotton seed	8.00	87.00
	Cotton seed cake	18.00	72.00
	Ground nut cake	41.00	74.00
	Til cake	32.00	72.00
	Linseed cake	30.00	65.00
ii)Animal protein	Fish meal	59.98	64.1
	Meat meal	50.00	65.00
	Blood meal	89.00	90.00
III) *Unconventional Feedstuffs*	Ambadi cake	5.7	62.4

	Mahua cake	3.7	73.7
	Neem cake	11.0	55.0
	Nigar cake	18.9	58.7
	Tamarind seed	13.0	64.0
	Salseed meal	0.0	41.0
	Tapioca waste	2.0	64.7
	Tomato pomace	1.43	41.0
	Mango seed kernel	6.0	70.0
	Babul pods	10.0	74.0
	Sugarcane tops	4.0	47.8

Chapter-14

FEED SUPPLEMENTS AND FEED ADDITIVES

Feed supplements are the compounds used to improve the nutritional value of basal feeds so as to take care of any deficiency.
Following are some commonly used supplements:-

- **Vitamin supplements-**

1. Now a days the use of vitamin supplements has become essential part of livestock ration.
2. Usually the different feedstuffs used for livestock feeding are deficient in one or more vitamins, and to care of these deficiencies individual/specific vitamin supplementation or use of vitamin mixture is done.
3. The commercial vitamin mixtures available in the market are Rovimix, Vitablend and Arivit**.**

- **Mineral supplements**

1. Mineral content of various feedstuffs is dependent on the soil profile and individual genetic variations.
2. Mineral requirements of animals varies with the age, size, sex, type and stage of production, therefore ration may not supply the required minerals in appropriate quantity leading to mineral deficiency conditions.
3. To take care of mineral deficiency the specific mineral sources like bone m,eal, common salt, calcium carbonate, rock phosphate are used.
4. Some commercially available mineral mixture are Minimix, Milkmin, Nutrimilk, Aromin.

Feed additives

Feed additives are the non-nutritive substances usually added to basal feed in small quantity for the fortification in order to improve feed efficiency and productive performance of the animals. They neither provide nutrients nor used as a drug for treatment of disease.

Importance:

1. *They give protection against undesirable environmental influences.*
2. *They change nutritional behaviour*
3. *They prevent the composition of feed from undergoing harmful biochemical reactions.*
4. *They improve the feed efficiency.*
5. *They improve the performance of animal directly or indirectly.*

Some commonly used feed additives are:

1. *Antibiotics-*

a) *Antibiotics are antibacterial chemical substances produced by the living organism which inhibits the growth or kills the bacteria.*
b) *The commonly used antibiotic feed additives are Terramycin, Zinc bacitracin, Flavomycin etc.*
c) *They are added in smaller quantity.*
d) *Use of antibiotics is beneficial in cattle and buffalo calves up to 3 months of age and in poultry up to 8-10 weeks of age.*
e) *The effect of antibiotic is more marked in animals reared in unhygienic conditions.*
f) *They inhibit pathogenic organisms causing subclinical infections.*

g) *They may increase the number and activity of organisms those synthesizing growth factors.*
h) *They may inhibit the growth of micro-organisms that compete with host for nutrients.*
i) *They increase absorptive capacity of intestine by thinning of intestinal wall.*

2. ***Enzymes:***

a) *Enzymes are the organic biological catalysts produced by the living cells.*
b) *They improves the digestion of proteins, carbohydrates, fats and chemical substances produced by endocrine glands.*
c) *products used in animal nutrition for purposes of improving the quality of feed and the quality of food from animal origin, or to improve the animals' performance and health, e.g. Providing enhanced digestibility of the feed materials."*

3. *Hormones:*
   Hormones are chemical substances produced by endocrine glands.
   They are also called as anabolic or endocrine modifier.
   Various hormones used as feed additives are diethylstilboestrol, hexosterol, estrogen, and progesterone.
   The use of hormone as feed additive is not common.
   They improve the performance of animal in respect of growth, reproduction and other body functions.
4. *Thyroproteins*
   They are substances which supplements the action of thyroid hormones.
   They increase milk production by 15-20%.
   They also stimulate growth and fattening.
5. *Probiotics*
   Probiotics are live cultures of certain microbial species specially lactobacillus.
   They improve general health.
   They increases feed efficiency, growth rate and milk production.
6. *Biostimulators*
   Extracts of living organs like spleen, liver, ovary, testes and chick embryo.
   Its role is regulatory rather than stimulatory.
   These are stimulators of protein metabolism and increases the nitrogen retention.
7. *Antioxidants*
   The compounds which prevents oxidative rancidity of polyunsaturated fats present in feedstuffs.
   They prevents the destruction of vitamins like A, D, E and K.
   The use of anti-oxidants permits the inclusion of high level of fat in ration without any ill effects.
   The best known antioxidants is Vit. E (Tocoferol)
   Commonly used are BHT (butylated hydroxy Toluene), santoguin, Ethoxyguin.
8. *Mould inhibitors*
   Substances which inhibit the growth of fungus/mould.
   They are also called as antifungal feed additives.
   Generally added to high moisture feed.

Examples are propionic acid, acetic acid, sodium propionate.
If mould has taken growth in the feed then chemicals like nystatin or copper sulphates are used.

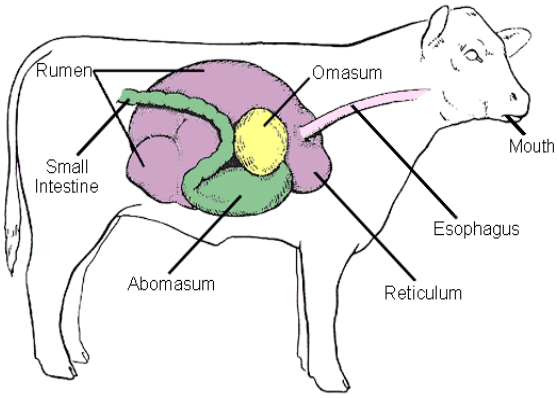
9. *Pellet binders*
   Substance used for preparing small cylindrical cubes of feed called pellet from feed mash.
   They increases the stickiness of mash mixture and give firmness to pellets.
   Can be added up to 2-2.5% of ration.
10. *Coccidiostate*
    Generally added in the ration of calves and poultry to prevent the protozoal disease like coccidiosis.
    Examples are Amprolium and Furazolidon.

There are four general types of feed additives:
1. **Sensory Additives –** these stimulate an animals appetite so that they naturally want to eat more.
2.**Nutritional Additives** – these provide a particular nutrient that may be deficient in an animal's diet.
3.**Zootechnical Additive** – these improve the overall nutritional value of an animal's diet through additives in the feed.
4. **Coccidiostats and Histomonostats** – these are feed additives which are antibiotics, intended to kill or inhibit protozoa (bacteria/micro-organisms). These have been banned in many countries and replaced with probiotic alternatives.

CHAPTER-15

Feeding of Livestock and Poultry

Principles of cattle feeding:



1. The average dry matter (DM) requirement of cross bred cow and buffalo is 2.5% (Dry cow) to 3.0% (lactating cow)
2. The roughage requirement is fulfilled through green and dry fodders. About 2/3rd DM requirement is fulfilled through dry fodder and remaining 1/3rd from green fodder.
3. The concentrate requirement of animal for maintenance, production and pregnancy is satisfied as follows-
    a. The maintenance requirement of Deshi cow and cross bred cows/buffalo is 1 and 1.5 kg respectively.
    b. Lactating animals should be given 1 kg of additional concentrate allowance for every 2.5 kg (buffalo) to 3 kg (cow) milk produced.
    c. Pregnant cow/buffalo should receive 1.5 kg/day extra concentrate allowance during advance pregnancy to meet extra need of nutrients for growth of foetus.
    d. Breeding bulls in service should get 1 kg/day extra concentrate allowance to maintain good health and sex libido
4. Mineral mixture and common salt each @ 25-50 gm should be given to fulfill mineral requirement of animal. Urea molasses mineral block licks containing deficient nutrients have proved especially useful under good management across the tropics.

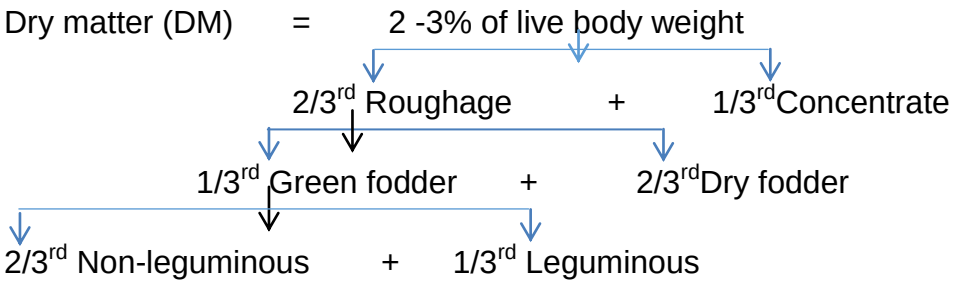
Ration: - Amount and composition of feed required by a Livestock in 24 hrs. of time period

Balanced ration: -A Balanced Ration is a combination of feed ingredients furnishing the various nutrients in proportion, forms and amounts that will meet the requirements of animal.

Formulation of Rations

1. Feeding standards take into account the physiological needs for specific functions such as maintenance, milk production, growth, pregnancy, and draught. These functions require adequate amounts of energy, protein, minerals and vitamins. In normal practice the main consideration is given to energy and protein needs.
2. The main feeding standards for various categories of livestock in different countries are National Research Council (NRC) recommendations of the United States and Agricultural Research Council (ARC) recommendations of the United Kingdom, which have been modified for local conditions in many countries such as for India. The Indian Council for Agricultural Research (ICAR 1984) recommendations for feeding dairy animals is appropriate for India.

3. Find out the DCP and TDN requirements for maintenance as well as for production, gestation and work.
4. Work out the total dry matter requirements of an animal. On an average it is 2.5-3.0% of live body weight of for a crossbred cow/buffalo
5. Distribute the dry matter requirements as given below:



6. Find out the amount of DCP and TDN supplied through the roughages. Also calculate the actual amount of roughage to be given on fresh matter basis.
7. Find out the amount of DCP and TDN supplied through the concentrate.
8. Give common salt and mineral mixture @ 1% of concentrate mixture.

Least cost ration:

Least cost ration is an economic ration for dairy cow which provides nutrients in balanced proportion with lowest possible cost. It is the ration containing all essential nutrients which are required to meet requirements of animal (growth, maintenance, production, reproduction, work, etc.) without affecting quality and with least costA least cost ration incorporates all the available feed stuffs having good nutritive value and available at reasonably low cost.

Maintenance ration:

1. It is minimum allowance of ration given to the animal for carrying out its essential body processes at optimum rate without gain or loss in the body weight or change in the body composition.
2. It is usually given to dry non-producing animals.
3. It provides all essential nutrients required for normal functioning of body.
4. It roughly satisfies the nutrient requirements for maintenance.
5. The allowance of concentrate mixture (with 15% DCP and 70% TDN) to be given is as below:
    a. Deshi cow : 1.0-1.5 kg/day
    b. Buffalo and crossbred cows : 1.5-2.0 kg/day
6. An adult cow weighing 400 kg needs 0.254 kg DCP and 3.03 kg TDN.

Gestation or pregnancy ration:

1. It is allowance of ration given to the pregnant animals in addition to maintenance ration during last quarter of pregnancy.
2. It is given to satisfy nutrient requirement of pregnant animals.
3. It is required for optimum fetal growth.
4. It helps in proper development of udder for future lactation.
5. It also helps to produce more milk after calving.
6. During advance pregnancy an extra allowance of concentrate mixture to be given, in addition to maintenance allowance, is as below:

B. Deshi cow : 1.0 - 1.5 kg/day
C. Crossbred cow and buffalo : 1.5 - 2.0 kg/day

7. Cow in advance pregnancy needs an additional amount of 0.14 kg DCP and 0.70 kg TDN

Production ration:

1. It is additional allowance of ration given to animals over and above the maintenance ration for the purpose of production like milk, meat, wool and work.
2. It is given to meet nutrient losses through milk.
3. It helps to maintain milk production to optimum level.
4. In lactating animals, the extra allowance of concentrate mixture to be given in addition to maintenance allowance is as below:
    a. Deshi cow : 1kg/2.5-3.0 kg milk
    b. Cross bred cow and buffalo : 1 kg/2.0-2.5 kg milk
5. A cow yielding milk of 5% fat requires an additional amount of 0.051 kg DCP and 0.370 kg TDN per kg of milk produced.

Proportion of various feed ingredients for preparing concentrate mixture

INGRADIENTS	**PROPORTION**
Oil cakes	25-30 Parts
Cereal grains	25-35 Parts
Cereal by products	10-25 Parts
Pulse chuni	15-20 Parts
Mineral mix.	3 Part
Common salt	1 Part
Vit. AD3	20-30 gm/100kg of feed

By-pass protein and NPN in ruminant diets

- By-pass proteins are defined here as those dietary proteins that pass, intact, from the rumen to the lower digestive tract.
- Digestible by-pass protein is that portion of the by-pass protein that is enzymatically hydrolysed in, and absorbed as amino acids from, the small intestine.
- Over-protected protein is that protein of the by-pass protein that is neither fermented in the rumen, nor digested in the small intestine.

Treatment of crop residues to improve digestibility

The treatment of crop residues with alkalis to improve digestibility is a well researched and established technique. Feeding treated straw as compared to untreated straw considerably improves ruminant's productivity.

Urea treatment of wheat straw and paddy straw

Simple techniques based on ensiling the wet straw (50% moisture) with 3–4% urea are well established and could be applied under village conditions for dry fodder and green fodder could be preserved in the form of Silage, Hay and Haylage

Steaming up/Challenge feeding:

Feeding grains to pregnant heifers prior to calving 2 1.5 kg/day helps in their growth, bears the stress of unborn viable calf, producing more milk after calving is termed as steaming up

Tips for feeding dairy cattle

- Concentrate must be feed individually according to production requirements.
- Good quality roughage saves concentrates. Approximately 20 kg of grasses (guinea, napier, etc.) or 6-8 kg legume fodder (cowpea, Lucerne) can replace 1 kg of concentrate mixture (0.14-0.16 kg of DCP) in terms of protein content.
- 1kg straw can replace 4-5 kg of grass on dry matter basis. In this case the deficiency of protein and other nutrients should be compensated by a suitable concentrate mixture.
- Regularity in feeding should be followed. Concentrate mixture can be fed at or preferably before milking – half in the morning and the other half in the evening – before the two milkings. Half the roughage ration can be fed in the forenoon after watering and cleaning the animals. The other half is fed in the evening, after milking and watering. High yielding animals may be fed three times a day (both roughage and concentrate). Increasing the frequency of concentrate feeding will help maintain normal rumen motility and optimum milk fat levels.
- Over-feeding concentrates may result in off feed and indigestion.
- Abrupt change in the feed should be avoided.
- Grains should be ground to medium degree of fineness before being fed to cattle.
- Long and thick-stemmed fodders such as Napier may be chopped and fed.
- Highly moist and tender grasses may be wilted or mixed with straw before feeding. Legume fodders may be mixed with straw or other grasses to prevent the occurrence of bloat and indigestion.
- Silage and other feeds, which may impart flavour to milk, may be fed after milking. Concentrate mixture in the form of mash may be moistened with water and fed immediately. Pellets can be fed as such.
- All feeds must be stored properly in well-ventilated and dry places. Mouldy or otherwise damaged feed should not be fed.
- For high yielding animals, the optimum concentrate roughage ratio on dry matter basis should be 60:40.

Nutrients requirements of different group of birds

S. No.	Nutrient	Broiler starter feed	Broiler finisher	Chick feed	Grower feed	Layer feed	Breeder feed
1.	Moisture	11	11	11	11	11	11
2.	CP	22	19	22	16	18	18
3.	CF	6	6	7	8	8	8
4.	A. In. Ash	3	3	4	4	4	4
5.	Salt	0.6	0.6	0.6	0.6	0.6	0.6

6.	Calcium	1.2	1.2	1	1	3	3
7.	Phosphorus	0.5	0.5	0.5	0.5	0.5	0.5
8.	Lysine	1.2	1.2	1	0.7	0.5	0.5
9.	Methionine	0.45	0.35	0.45	0.25	0.3	0.3
10	ME	2900	3000	2700	2700	2700	2800
CP-Crude protein, CF-Crude fibre, ME-Metabolizable energy							

Systems of feeding poultry

1. Whole grain feeding
2. Grain and mash method
3. All mash method
4. Pellet feeding method
5. Free choice system
6. Restricted feeding system

Computation of ration

Computation of ration is the scientific methods of preparing a ration for the poultry as per their requirements.

Important steps for computation of ration

1. Find out nutrients requirements of birds in terms of CP, ME, CF, Salt, Ca, P, Lysine, Methionine
2. Work out total amount of feed required by bird
3. Calculate the amount of different feed ingredients used for feed preparation.
4. Find out the amount of nutrients supplied through feed ingradients

Feeding:

- Birds have simple stomach and hence nutritive requirements are more precise and specific based upon purpose of rearing (meat/egg).
- Feed must have all the essential nutrients in balanced form.
- Clean, fresh and cool water must be made available at all times.
- Feed must be appetising and free from aflatoxins.
- Feed must have good effect on production and reproduction.

Chapter- 16

Introduction of Livestock and Poultry Diseases

Livestock and Poultry diseases cost millions of rupees losses every year. In addition to death, they cause loss of production and frequently a loss of body condition. Unhealthy animals require more food and take longer time for growth than healthy ones. Generally, animals are born free of diseases or parasites. But, they usually acquire these maladies either through contact with diseased animals or due to improper sanitation, feeding, care and management. Keeping animals healthy by confining purchases to healthy herds, by proper quarantine at the time of bringing in new animals, by employing sound principles of sanitation, management and feeding and by judicious use of appropriate and dependable vaccines are the practical and economical ways to avoid losses from the disease. By proper management and feeding, the dairy farmer can, to a great ex tent, prevent disease out-breaks.

Important diseases may be grouped into following:-

1. Bacterial 2. Viral 3. Protozoal 4. Parasitic 5. Fungal 6. Metabolic

1. Bacterial Diseases-

A. BLACK QUARTER (BQ)

An acute disease of cattle characterized by emphysematous swelling usually in heavy muscles. Buffaloes usually suffer from a milder form. Contaminated pasture appears to be major source of infection. Healthy animals in the age group 6 months to 2 years are generally affected.

SYMPTOMS

Sudden high fever (107ºF-108ºF) and the animal stops eating and ruminating. Characteristic hot and painful swelling develops on loin and buttocks causing lameness. Swelling sometimes affects shoulders, chest and neck also. When pressed, a crackling sound is heard because of the gas accumulation in the swellings. Animal dies within 24-48 hrs of appearance of symptoms. At this juncture, swellings become cold and painless.

TREATMENT

Treatment may be effective in initial stages of infection. However in most cases treatment is not worth the while.

PREVENTION

Vaccinate all animals which are 6 months and above of age annually before the onset of monsoon in endemic areas. Burning the upper layer of soil with straw to eliminate spores may be of help in endemic areas. Sprinkle lime over carcass at the time of burial.

B. HAEMORRHAGIC SEPTICAEMIA (HS)

This is an acute bacterial disease of cattle and buffaloes which usually occurs during monsoon. Mortality rate may be as high as 80 %. Germs of this disease survive longer in humid and waterlogged conditions.

SYMPTOMS

High temperature, sudden decrease in milk yield. Salivation and serous nasal discharge. Severe oedema of the throat region. Difficulty in breathing, animal produces a grunting sound. Animal usually dies within 1-2 days of showing symptoms. Buffaloes are generally more susceptible than cattle. Animals with clinical signs, particularly buffalo, rarely recover. In endemic areas, most deaths seen in older calves and young adults.

TREATMENT

Treatment is usually ineffective unless treated very early, that is during the stage when fever sets in. Few animals survive once clinical signs develop. Case fatality approaches 100% if treatment is not followed at the initial stage of infection.

PREVENTION

Segregate the sick animal from healthy ones and avoid contamination of feed, fodder and water. Avoid crowding especially during wet seasons. Vaccinate all animals which are 6 months and above of age annually before the onset of monsoon in endemic areas.

Get your animals vaccinated annually against HS before rains

C. ANTHRAX

A highly fatal bacterial disease affecting all farm animals. Disease is characterized by high fever, respiratory distress, bleeding from orifices and sudden death. Infection is due to ingestion of contaminated feed and fodder with spores of the bacteria, which can survive for up to 30 years in the soil. Treatment is usually ineffective unless done at very early stages. Humans get infection by eating infected raw meat, contact with infected animals or by inhalation of spores.

PREVENTION

Regular annual vaccination of animals in endemic areas will prevent the disease from occurring. Vaccination may be carried out at least a month prior to expected disease occurrence in endemic areas. Never open a carcass of an animal suspected to have died from Anthrax. Contact a veterinarian immediately if the above symptoms are seen and seek advice on control measures to be adopted.

D. BRUCELLOSIS (CONTAGIOUS ABORTION)

An important bacterial disease of cattle and buffalo. Leads to loss in milk production, loss of calf, birth of weak or diseased calf, repeat breeding and even mastitis. Humans may also get the disease from consumption of raw milk of infected animal or contact with uterine discharges. The disease is very much prevalent in India, both in humans and animals.

SYMPTOMS

Abortion occurs typically after 5th month of pregnancy. In an infected animal, chances of abortion reduces with number of calving. No abortions may be observed after 4th calving, but dam and calf remain infected. Placental retention may lead to infection and even death of the animal.

TREATMENT

There is no effective treatment once the animal is infected since the bacteria remains in the body of the animal. Consult a veterinarian in case of suspicion. Disease in humans is curable provided proper treatment regimen is followed.

PREVENTION

Vaccinate female calves (not male calves) between 4-8 months of age. Only one vaccination is required in its lifetime to protect it from brucellosis. Any abortion from 5th month onwards should be suspected for brucellosis. The aborted foetus, placenta, contaminated bedding, feed etc., should be buried (at least 4 feet deep) after a liberal sprinkling of lime. These materials contain very high bacterial. Do not handle infected material with bare hands since the disease is zoonotic. ***Vaccinate 4-8 month old female calves once - protect them for life.***

E. Bovine Tuberculosis (bTB)

It is also an important bacterial disease of cattle and buffalo. The disease develops over a number of years and results in weakness, coughing and weight loss. Also leads to anorexia, emaciation, difficulty in breathing, enlargement of lymph nodes and diarrhoea. The disease is also transmissible to humans.

Prevention and control

Bovine Tuberculosis is also not curable. Positive animals should be culled from farm as it may infect other healthy animals. Purchase new animals only after testing them. Induct only negative animals to your farm. Carry out regular testing of your animals. Consult a veterinarian to test your animals for btb.

F. Johne's disease

An important bacterial disease of ruminants causing long-lasting diarrhoea with heavy economic losses. Loss of weight despite good appetite. Bottle jaw may also appear. Once clinical signs appear the animal will not recover and will continue to deteriorate.

Prevention and control Johne's disease is not curable. Positive animals should be culled from farm as it may infect other healthy animals. Purchase new animals only after testing them. Induct only negative animals to your farm. Carry out regular testing of your animals. Consult a veterinarian to test your animals for Johne's disease. *Purchase only negative animals to avoid TB and JD.*	

G. Foot rot

Foot rot is a bacterial infection which is of great economic importance for dairying. The incidence varies according to weather, season of year, grazing periods, housing system, type of flooring etc. Stony ground, sharp gravel and pasturing on coarse stubble also predispose to the condition.

2. Viral diseases

A. Foot and mouth disease (FMD)

A highly contagious viral disease. Spreads through contact, contaminated water, feed and air. Disease is rarely fatal for adults, however the milk production, fertility in females and draft power of males are severely impaired for life after recovery from

disease. Usually fatal in calves. Also affects sheep, goat (usually sub-clinically and are maintenance hosts) and pigs, which are amplification hosts (multiplies the virus around 3000 fold).

Symptoms

Drastic drop in milk production and working capacity (draft animals). Fever and serous nasal discharge and excessive salivation. Vesicles may be seen on tongue, dental pad, lips, gums etc. Vesicle in inter-digital cleft may lead to lameness. Lesions on teat may lead to mastitis. Loss in condition may persist even after recovery.

Prevention

Get your animals aged 4 months and above vaccinated once in 6 months. Infected animals should be immediately separated since all excretions and secretions from infected animals contain the virus. All feed and fodder in contact with the infected animal should be destroyed. All equipment used should be cleaned and disinfected with 4% sodium carbonate solution as suggested by a veterinarian. Healthy animals should not be handled by persons in contact with infected animals. The infected premises should be disinfected with 4% sodium carbonate solution or with the disinfectant suggested by a veterinarian. Vaccinating sheep, goat and pigs would control the disease to a better extend. Informing authorities promptly would enable them initiate control measures at the earliest which will help in limiting the spread of the disease.

Vaccinate your animals regularly against FMD to avoid economic losses

B. Rabies

A highly fatal viral disease mainly transmitted by bite of a rabid dog.

Humans can get the disease through bites of rabid dogs.

Wild carnivores and bats also present a considerable risk where the disease is prevalent. The disease is endemic in India.

Common symptoms

Hyper excitability. Drooling of saliva. Peculiar hoarse sound (bellowing). Aggression or paralysis. The animal dies within 24-48.hours after appearance of first sign, which may be mostly seen within 3 weeks or as late as 5-6 months of the dog bite. Once symptoms are seen, death is inevitable.

Prevention

Wash the wound immediately in running water for 5-10 minutes. Gently clean the wound with bath soap. Consult a veterinarian immediately. Carry out post-bite vaccination in suspected cases. Protect your pet dogs and cats against the disease through annual vaccination.

C. Ephemeral fever (Three day sickness)

Ephemeral fever is viral disease of cattle and buffalo. It is an insect-transmitted disease. Persists usually for 3 days. Morbidity may be very high but mortality is very low (1-2%).

D. Calf Scours/ calf diarrhea: Calf scours is caused by bacterial, viral and sometimes even by parasitic infections. Newborn dairy animals are especially susceptible to calf scours because their immunity systems are not fully developed. Severe fluid loss due to calf scours results in dehydration and often leads to death. Unfortunately, even animals that survive calf scours often remain weak and perform poorly throughout their lives. Calf scours is also called calf diarrhea ,

E. Mad Cow Disease (BSE): Bovine Spongiform Encephalopathy is also known as BSE. The disease is most commonly referred to as Mad Cow Disease. BSE is a progressive degenerative disease that affects the central nervous system of cattle. BSE has an incubation period of four to five years. The disease can go undetected for years as there may be no outward signs. BSE is fatal for cattle and death results within weeks to months of its onset. BSE first came to the attention in November

1986 with its appearance in cattle of United Kingdom (UK).Scientists have not found the exact cause of BSE but it is believed to be caused by abnormal proteins called prions. Other experts say that BSE can be caused by a virus-like organism. New forms of BSE have been affecting cattle around the world.

F. Anaplasmosis: Anaplasmosis is an infectious disease of cattle that affects the red blood cells that transport oxygen in the blood. Affected red blood cells are not able to take part in circulation and die. Once they have died, they are removed by the body and from circulation. Anaplasma marginale and Anaplasma centrale. They are commonly found inside ticks, biting insects and houseflies. Any instrument with infected blood on it can also transmit the disease. However Anaplasmosis does not affect humans.

G. Coccidiosis: Coccidiosis is an intestinal disease that affects several different animal species. The causative agent is a protozoan that has the ability to multiply rapidly. Coccidiosis is seen most commonly in calves that are six to twelve months of age. Calves become infected when placed on pastures contaminated by older cattle or by other infected calves. Coccidiosis in cattle is one of the five most economically devastating diseases of the Dairy industry.

H. Wooden Tongue: Wooden tongue is a well-defined disease that affects the soft tissues of the mouth region in adult cattle. The disease is fairly acute. It causes swelling in the affected area as well as under the jaw which makes food intake difficult, so animals weaken quickly. Wooden Tongue disease is the trivial name of Actinobacillosis. Wooden tongue is an infection caused by the bacterium Actinobacillus lignieresii.

I. Milk fever: Milk fever is a condition of older, third to sixth lactation, high-producing dairy cows. It is associated with parturition, usually within 72 hours of giving birth. Because of the high volume of milk produced during this time, and subsequent demand for calcium, these cows often develop hypocalcaemia, or abnormally low levels of calcium in the blood. Since calcium is required for the release of acetylcholine at the neuromuscular junction, affected animals will begin to experience muscle weakness. As this hypocalcaemia worsens, the cow will become too weak to stand and will eventually become comatose over a matter of hours. Calcium is the most common mineral in the body and the major extra-cellular divalent cation. Is a structural component of bones and teeth. Over 98% of Ca present in the body is found in bone. Is also important in muscle contraction (this is the main reason cows suffering from milk fever go down). Also plays a role in blood clotting and nerve impulse transmission. Calcium is critically important to normal nerve and muscle function. Acetylcholine, a neurotransmitter substance acting at the neuromuscular junction loads and if disposed improperly cause the spread of disease by contaminating food sources (pasture, feed, water etc).

J. **Ketosis**: Ketosis or acetonemia is a common metabolic disease of lactating cows occurring during the first 10 to 60 days after calving in high-producing cows. The three-week period after calving seems to be the most critical time. The disease results from a lowered blood sugar in the circulating blood, which causes the formation and release of ketone bodies. Ketone bodies (specifically ace tone) are volatilized and account for the "sweetish" smell detectable on the breath, and in the milk or urine of affected cows. The incidence of ketosis is higher in older cows and high-producing cows. As cows produce milk, they become more susceptible. Common Symptoms: Symptoms of ketosis in dairy cattle include dullness, depression, a staring expression, rapid loss of weight, a drop in milk production, constipation, mucus covered feces, incoordination and partial paralysis.

K. **Aflatoxicosis**

Disease is caused by toxins produced by mold (fungus) that grows on feed (e.g. ground nut cake, maize etc) and stored fodder that is damp. Also known as

"Degnala" disease in cattle & buffaloes. The toxins can occur in concentrations high enough to cause major losses in health and performance of the animal. The economic impact of reduced productivity is many times the impact caused by fatalities, milk production may drop by more than 15%.

L. Babesiosis

Babesiosis is caused by a type of microbe called protozoa. Fever, inappetence, increased respiratory rate, sharp decrease in milk production, muscle tremors, anaemia, jaundice, abortion, constipation or diarrhoea are the common symptoms. Curable if treated promptly. In later stages, loss of weight with haemoglobinuria is seen. Nervous symptoms may also be seen. It is better to repeat treatment if colour of urine does return to normal by 24 hours after treatment. Babesiosis is not to be confused with "Red Water Disease" which is an acute highly fatal bacterial disease seen especially in areas with liver fluke infestation. Disinfect the shed after isolating the aborted animal. When the animal is in isolation, disinfect the lochial discharges (which also contain high bacterial loads) daily with 1-2% NaOH or 5% sodium hypochlorite (bleach) solution till the discharges cease (usually by 10 –15 days).

M. Trypanosomiasis (Surra)

An important disease of cattle and buffalo caused by protozoa. Transmitted mechanically by biting flies. Cattle and buffalo also are reservoir hosts to horses and camels. Blood from infected animal, occasionally meat and milk are the sources of infection. There is severe loss of productivity due to anaemia. Animals under stress are more susceptible to the disease.

Symptoms

Progressive anaemia, weight loss and weakness. Abortions, infertility and stillbirth may occur in buffaloes. Cattle may have a chronic course with high mortality and may last up to 2 years. Death may occur in 2 weeks to 2 months. Oedematous swellings of the lower parts of the body (legs, briskets and abdomen) may be seen. Lymph nodes also may be swollen. Nervous signs like head tilt, circling, blindness, hyper-excitability, paddling movements may also be seen.

Treatment

Call the veterinarian immediately on seeing the symptoms for treatment. Timely and early treatment ensures a high cure rate.

Prevention

Control fly population (see chapter on fly control). Sufficient ventilation and sunlight should be available in the shed. Insecticide applications may be done in the shed and surrounding areas under advice of a veterinarian.

Retained Fetal Membranes (RFM)

Primary symptoms- Hanging of fetal membranes from the vulva. This is one of the most common conditions occurring in animals following parturition. This is failure of the villi of the fetal cotyledon to detach from the maternal crypts of the caruncles and retained longer than normal time limits. If the placenta is retained longer than 8-12 hours the condition is considered as pathological.

Causes

Infections of uterus during gestation may be a cause for retained placental membranes. Uterine inertia due to hormonal imbalance such as low level of oxytocin. Deficiency of Vitamin A and iodine causes retained placenta. The hormone progesterone and excess of cortisol in late gestation may cause the retention of fetal membranes. The disease conditions causing uterine inertia or atony results in a higher incidence of retention of foetal membranes. Close confinement and lack of exercise highly prone to retained placenta.

Clinical signs

A portion of the fetal membranes hang from the vulva 12 hours or more even after the expulsion of the foetus. Anorexia and depression may develop. A fetid odour develops since the placenta begins to macerate after 24 hours of foetal expulsion.

Treatment

It should be handled with qualified veterinary doctor by manual removal. Before arriving veterinarian, the hanging foetal membranes should be protect from dogs or other animals. The protruding membranes should be tied in a knot to prevent them touching the hocks. Manual removal can be attempted in 24- 48 hours after parturition. Manual removal after 48 hours is not advisable because cervix was closed. Manual removal of placenta is contraindicated in cows with elevated temperature and also with vaginitis and vulvitis. After removing the fetal membranes, tetanus toxoid injection is recommended to prevent tetanus infection.

Bloat/Tympany/Afra

Bloat is a form of indigestion marked by excessive accumulation of gas in the rumen. Bloat can occur when the animal grazes on lush young pasture, particularly if the pasture is wet. Some plants, e.g. clover, lucerne and alfalfa are especially dangerous in causing bloat but any fast growing plants can cause it.

In severe cases, puncturing the left flank with a sharp knife to release the gas is necessary, it will be necessary for you to act quickly as any hesitation could lead to the death of the animal.

Acute mastitis

It is one of the 3 forms of contagious udder infections where physical changes are clearly visible in udder and milk. High yielding animals are more prone. Mainly caused by bacteria (around 100 types). Also caused by fungi, virus & rarely by algae.

Treatment

Contact a veterinarian immediately. Early treatment (within 2-3 hours) improves the chances of cure, delayed treatment may cause loss of udder or even death of animal. Milk of animal suffering from mastitis should be discarded at least for 4 days after the treatment is over or as directed by the veterinarian.

Prevention

Manage the pre-disposing factors of mastitis properly. Before milking, clean the udder well with clean water and wipe dry with clean towel. Should use separate cloth towel for each animal. Disposable paper towel is also an option. Repeated use of unclean towel may itself predispose to mastitis. Milking should be quick, complete and hygienic. Milk animals with chronic mastitis in the end. Carry out teat dipping or spray immediately after milking. Prevent the animal from sitting for at least 30-45 minutes after milking. Periodically check and treat for sub-clinical mastitis (see chapter on this). Keep the floor of the cattle shed without holes and as dry as possible. Continue teat dipping/spray 2 weeks after drying off and start the practice two weeks before calving. ***Detect and treat cases early. Avoid loss of udder or animal.***

B. Chronic Mastitis

A persistent infection of udder. Exists most of the time in the subclinical form. Occasionally can develop into the clinical form before returning to the subclinical. This results in hard lumps in the udder.

Major symptoms

The affected udder may atrophy or may lead to fibrosis leading to decreased or total loss of production in the affected quarter. Chances of recovery of chronically affected quarters are very low once atrophy/fibrosis has occurred.

Major pre-disposing factors

Neglected subclinical mastitis improper treatment protocol of acute mastitis unhygienic shed.

Prevention

Separate the affected cow from rest of the herd since they remain a source of infection for healthy animals. Milk chronically affected cows in the end. Screen regularly for sub clinical mastitis and treat positive animals. Shed hygiene is of prime importance.

Treatment

Antimicrobial treatment is usually not effective. It is better to dispose off such chronically affected animals.

C. Sub-clinical mastitis (SCM)

Most prevalent form of mastitis - causes about 70% of the losses due to mastitis. Causes heavy losses due to its prolonged effect throughout lactation. The other forms of mastitis (clinical or chronic) develop from this stage.

Symptoms

No specific symptom seen except a slight decrease in milk production. Cannot be normally detected since there is no physical changes in udder or milk

Detection of SCM

California Mastitis Test *Strip cup test*

CMT - Equal quantities of milk and CMT reagent are mixed by rotating, SCM milk will form a gel. CMT reaction may disappear within 20 seconds, readings must therefore be taken fast. Also check each quarter separately. CMT may give false positive reaction in very early (less than 10 days) lactation or when animal is almost dry. Strip cup test - Small flakes are present in SCM milk when viewed against a black surface, size of flakes increase with the degree of SCM. Paper test - Green colour is indicative of SCM. Field mastitis test - Can be carried out like CMT using concentrated detergent solution instead of CMT reagent.

Treatment

Consult a veterinarian for proper treatment. The chances of curing SCM is much higher than a clinical or chronic case. Timely treatment of SCM will also reduce the chances of clinical and chronic cases of mastitis.

Prevention of SCM

All the points mentioned for prevention of ‘clinical mastitis’ are relevant here too. Test for the occurrence of SCM in your animals at least once a week. Each quarter should be separately tested. Newly purchased animals should be tested first for SCM and treated if found positive before mixing them with the herd. SCM positive animal (s) should always be milked at the end. If animals are tethered in open, change places frequently. Ideally, no lubricant should be used during milking. If used, it should be heated daily before use.

Common diseases of Sheep and Goat and their control

1. Blue tongue (BT)

It is **basically a disease of sheep** and **young sheep within the age group** of one year are more prone to infection. The disease occurs mainly during the rainy season particularly in the months of October, November and December.

2. Peste-des-Petits Ruminants (PPR)

It is an acute highly contagious viral disease of small ruminants characterized by **fever, loss of appetite, stomatitis, gastroenteritis and pneumonitis.**The disease is markedly evident in goat and sheep are less susceptible.

3. Sheep and goat pox

Sheep and goat pox is a contagious viral disease of sheep and goats manifested by papular and pustular eruptions on the skin and in generalized conditions with haemorrhagic inflammation of the respiratory tract.

Tetanus

It is a non-contagious, infectious disease of mammals caused by bacterial toxin characterized by spasmodic

contraction of skeletal muscles. Sheep and goat are more susceptible than cattle

4. Enterotoxaemia (Pulpy kidney)

This disease is a fatal toxaemia in lambs, sheep, goats, calves and seldom in adult cattle. The disease is manifested by diarrhoea, involuntary contraction of muscles, paralysis and sudden death.

5. Rift valley fever (RVF)

RVF is an acute viral disease of sheep, cattle, goats and humans.

6. Contagious ecthyma (contagious pustular dermatitis, orf)

A highly infectious pox virus disease of sheep and goats manifested by the occurrence of the pustular and scabby lesions on the lips, muzzle and udder.

7. Scrapie

Scrapie is a chronic disease of the central nervous system in sheep and occasionally goats characterized by itching, nervous signs and a long incubation period. It is caused by a viral agent called "*viroid*" or "*prion*", which has some of the characteristics of the virus, a "slow" virus like BSE and Maedi.

8. Pulmonary adenomatosis (Jaagsiekte, Driving sickness)

Pulmonary adenomatosis is a chronic progressive pneumonia of sheep with the development of a primary lung neoplasm.

9. Ovine progressive interstitial pneumonia (Maedi, Maedi-visna)

Maedi/visna is a highly fatal viral disease of sheep and goats caused by a *lentivirus*.

Nairobi sheep disease

Nairobi sheep disease is a non-contagious, *tick borne viral disease* in sheep manifested by acute haemorrhagic inflammation of the stomach and intestine and by respiratory signs.

10. Contagious caprine pleuropneumonia

Contagious caprine pleuropneumonia is a contagious disease of goats caused by *Mycoplasma mycoides subs. capri* (mycoplasma biotype F 38).

11. Haemonchus contortus (abomasum-sheep-goat)

The principal stomach worms of sheep and goats are *Haemonchus contortus*, *Teladorsagia (Ostertagia) circumcincta*, *Ostertagia trifurcata*, *Trichostrongylus axei* and in some tropical regions, *Mecistocirrus digitatus*. Cross-transmission of *Haemonchus* between sheep and cattle can occur but not as readily as transmission between homologous species. Sheep are more susceptible to the cattle species than cattle are to the sheep species.Haemonchosis in sheep may be classified as hyper acute, acute, or chronic. In the hyper acute disease, death may occur within 1 wk of heavy infection without significant signs. The acute disease is characterized by severe anaemia accompanied by generalized edema; anaemia is also characteristic of the chronic infection, often of low worm burdens,

and is accompanied by progressive weight loss. Diarrhoea is not a sign of pure *Haemonchus* infection; the lesions are those associated with anaemia. In cases in which diarrhoea is present, there may be mixed infection with other worm genera.

12. Pregnancy/Gestationtoxemia/Ketosis

Pregnancy toxaemia occurs when drastically low levels of glucose in the blood damage the brain and result in dehydration, kidney failure and potentially death. It usually occurs in the last weeks of pregnancy with the ewes most advanced in pregnancy affected before the rest of the flock. Pregnancy toxaemia occurs when the pregnant ewe does not receive enough nutrition in ewes in late pregnancy and ewes with twin lambs. A glucose drench or injectable glucose every 6–12 hours will provide a rapid increase in the ewe's blood sugar levels. Offer good quality hay and oats to the affected ewe if she is able to eat. If ewes do not respond to treatment within 12 hours, they should be humanely euthanized.

Common diseases of Poultry

Newcastle Disease

Newcastle disease is characterized by a sudden onset of clinical signs which include hoarse chirps (in chicks), watery discharge from nostrils, laboured breathing (gasping), facial swelling, and paralysis, trembling, and twisting of the neck (sign of central nervous system involvement). Mortality ranges from 10 to 80 per cent depending on the pathogenicity.

Treatment - There is no specific treatment for Newcastle disease. Antibiotics can be given for 3-5 days to prevent secondary bacterial infections. For chicks, increasing the brooding temperature 5°F may help reduce losses.

Prevention - Prevention programs should include vaccination, good sanitation, and implementation of a comprehensive biosecurity programme.

Marek's Disease

Marek's disease is a type of avian cancer. Tumours in nerves cause lameness and paralysis. Tumours can occur in the eyes and cause irregularly shaped pupils and blindness. Tumours of the liver, kidney, spleen, gonads, pancreas, proventriculus, lungs, muscles, and skin can cause incoordination, unthriftiness, paleness, weak labored breathing, and enlarged feather follicles. In terminal stages, the birds are emaciated with pale, scaly combs and greenish diarrhea. Marek's disease is very similar to Lymphoid Leukosis, but Marek's usually occurs in chickens 12 to 25 weeks of age and Lymphoid Leukosis usually starts at 16 weeks of age.

Treatment - none

Prevention - Chicks can be vaccinated at the hatchery. While the vaccination prevents tumour formation, it does not prevent infection by the virus.

Infectious Bronchitis

The severity of infectious bronchitis infection is influenced by the age and immune status of the flock, by environmental conditions, and by the presence of other diseases. Feed and water consumption decline. Affected chickens will be chirping, with a watery discharge from the eyes and nostrils, and laboured breathing with some gasping in young chickens. Breathing noises are more noticeable at night while the birds rest. Egg production drops dramatically. Eggshells become rough and the egg white becomes watery.

Treatment - There is no specific treatment. Antibiotics for 3-5 days may aid in combating secondary bacterial infections. Raise the room temperature 5°F for

brooding-age chickens until symptoms subside. Baby chicks can be encouraged to eat by using a warm, moist mash.

Prevention - Establish and enforce a biosecurity program. Vaccines are available.

Fowl Pox

The dry form of fowl pox is characterized by raised, wart-like lesions on unfeathered areas (head, legs, vent, etc.). In laying hens, infection results in a transient decline in egg production. In the wet form there are canker-like lesions in the mouth, pharynx, larynx, and trachea. The wet form may cause respiratory distress by obstructing the upper air passages.

Treatment - No treatment is available. However, fowl pox is relatively slow-spreading. Thus, it is possible to vaccinate to stop an outbreak.

Prevention - Fowl pox outbreaks in poultry confined to houses can be controlled by spraying to kill mosquitoes. However, if fowl pox is endemic in the area, vaccination is recommended.

Avian Influenza

Avian influenza is categorized as mild or highly pathogenic. The mild form produces listlessness, loss of appetite, respiratory distress, diarrhea, transient drops in egg production. The highly pathogenic form produces facial swelling, blue comb and wattles, and dehydration with respiratory distress. Dark red/white spots develop in the legs and combs of chickens. There can be blood-tinged discharge from the nostrils. Mortality can range from low to near 100 per cent. Sudden exertion adds to the total mortality. Egg production and hatchability decreases. There can be an increase in production of soft-shelled and shell-less eggs.

Treatment - There is no effective treatment. With the mild form of the disease, good husbandry, proper nutrition, and broad spectrum antibiotics may reduce losses from secondary infections. Recovered flocks continue to shed the virus.

Prevention - A vaccination programme used in conjunction with a strict quarantine has been used to control mild forms of the disease. With the more lethal forms, strict quarantine and rapid destruction of all infected flocks remains the only effective method of stopping an avian influenza outbreak. If you suspect you may have Avian Influenza in your flock, even the mild form, you must report it to the state veterinarian’s office.

Infectious Laryngotracheitis

Chickens 14 weeks and older are more susceptible than young chickens. Most outbreaks occur in mature hens. The clinical sign usually first noticed is watery eyes. Affected birds remain quiet because breathing is difficult. Coughing, sneezing, and shaking of the head to dislodge exudate plugs in the windpipe follow. Birds extend their head and neck to facilitate breathing (commonly referred to as “pump handle respiration”). Inhalation produces a wheezing and gurgling sound. Blood-tinged exudates and serum clots are expelled from the trachea of affected birds. Many birds die from asphyxiation due to a blockage of the trachea when the tracheal plug is freed.

Treatment - Administer antibiotics to control secondary infection, and vaccinate the flock. Vaccination of individual bird by the eye-drop route is suggested. In small poultry flocks, use a swab to remove plug from gasping birds.

Prevention - Vaccinate replacement birds for outbreak farms.

Aspergillosis

Aspergillosis occurs as an acute disease of young birds and a chronic disease in mature birds. Young birds have trouble breathing and gasp for air. Characteristically, there are no rales or respiratory sounds associated with aspergillosis. Feed consumption decreases. Occasionally there is paralysis or convulsions caused by the fungal toxin. Mortality in young birds averages 5-20 per cent, but may be as high as 50 per cent. Mature birds also have respiratory distress, reduced feed consumption, and may have a bluish and dark colour of the skin (cyanosis). Nervous disorders, such as twisted necks, may occur in a few birds. Mortality in mature birds is usually less than 5 per cent.

Treatment - There is no cure for infected birds. The spread can be controlled by improving ventilation, eliminating the source of the infection, and adding a fungistat (mycostatin, mold curb, sodium or calcium propionate, or gentian violet) to the feed and/or copper sulfate or acidified copper in the drinking water for 3 days. The litter can be sprayed lightly with an oil-base germicide to control dust and air movement of fungal spores.

Prevention - It is important to thoroughly clean and disinfect the brooding area between broods. Use only clean litter, preferably soft wood shavings. Do not use sawdust, litter high in bark content, or shavings that have been wet.

Lymphoid Leukosis

The virus involved has a long incubation period (4 months or longer). As a result, clinical signs are not noticeable until the birds are 16 weeks or older. Affected birds become progressively weaker and emaciated. There is regression of the comb. The abdomen becomes enlarged. Greenish diarrhea develops in terminal stages.

Prevention

The virus is present in the yolk and egg white of eggs from infected hens. Most national and international layer breeders have eradicated lymphoid leukosis from their flocks.

Infectious Bursal Disease

In affected chickens greater than 3 weeks of age, there is usually a rapid onset of the disease with a sudden drop in feed and water consumption, watery droppings leading to soiling of feathers around the vent, and vent pecking. Feathers appear ruffled. Chicks are listless and sit in a hunched position. Chickens infected when less than 3 weeks of age do not develop clinical disease, but become severely and permanently immunosuppressed.

Treatment - There is no specific treatment. Vitamin- electrolyte therapy is helpful. High levels of tetracyclines are contraindicated because they tie up calcium, thereby producing rickets.

Prevention - Vaccine is commercially available.

Egg Drop Syndrome

There are no reliable signs other than the effects on egg production and egg quality. Healthy-appearing hens start laying thin-shelled and shell-less eggs. Once established, the condition results in a failure to achieve egg production targets. Transient diarrhea and dullness occur prior to egg shell changes. Fertility and hatchability are not affected.

Treatment - There is no successful treatment. Induced molting will restore egg production.

Prevention - Prevention involves a good biosecurity program.

Fowl Cholera

Fowl cholera usually strikes birds older than 6 weeks of age. In acute outbreaks, dead birds may be the first sign. Fever, reduced feed consumption, mucoid discharge from the mouth, ruffled feathers, diarrhea, and laboured breathing may be seen. As the disease progresses birds lose weight, become lame from joint infections, and develop rattling noises from exudate in air passages. As fowl cholera becomes chronic, chickens develop abscessed wattles and swollen joints and foot pads. Caseous exudate may form in the sinuses around the eyes. Turkeys may have twisted necks.

Treatment - A flock can be medicated with a sulfa drug (sulfonamides, especially sulfadimethoxine, sulfaquinonxalene, sulfamethazine, and sulfaquinoxalene) or vaccinated, or both, to stop mortality associated with an outbreak. It must be noted, however, that sulfa drugs are not FDA approved for use in pullets older than 14 weeks or for commercial laying hens. Sulfa drugs leave residues in meat and eggs. Antibiotics can be used, but require higher levels and long term medication to stop the outbreak.

Prevention - On fowl cholera endemic farms, vaccination is advisable. Do not vaccinate for fowl cholera unless you have a problem on the farm. Rodent control is essential to prevent future outbreaks.

Omphalitis

Affected chicks may have external navel infection, large unabsorbed yolk sacs, peritonitis with foetid odour, exudates adhering to the navel, oedema of the skin of ventral body area, septicemia and dehydration.

Treatment - There is no specific treatment for omphalitis. Most affected birds die in the first few days of life.

Prevention - Control is by prevention through effective hatchery sanitation, hatchery procedures, breeder flock surveillance, and proper preincubation handling of eggs. Mushy chicks should be culled from the hatch and destroyed.

Salmonella Pullorum

Death of infected chicks begins at 5-7 days of age and peaks in another 4-5 days. Clinical signs - huddling, droopiness, diarrhoea, weakness, pasted vent, gasping, and chalk-white feces, sometimes stained with green bile. Affected birds are unthrifty and stunted because they do not eat. Survivors become asymptomatic carriers with localized infection in the ovary.

Treatment - Treatment is for flock salvage only. Several sulfonamides, antibiotics, and antibacterials are effective in reducing mortality, but none eradicates the disease from the flock.

Prevention - Pullorum outbreaks are handled, on an eradication basis. Breeder replacement flocks should be tested before onset of production to assure pullorum-free status.

Management-related Problems

Nutritional problems

Birds that are fed an adequate diet made up from a good commercial feed are unlikely to suffer from nutritional problems unless there are additional factors involved, such as diseases that result in diarrhoea or otherwise interfering with the digestive system.

Stress

Any form of stress may result in a disease outbreak, or diseases in individual birds, as a result of a disease causing organism that is not normally a problem. Any disease will also result in stress, and may therefore increase the potential for other diseases. Stress may result in the immune system not being able to cope with the disease challenge.

Curled toe paralysis

Deficiency of Riboflavin
Poor growth
Weakness
Emaciation and diarrhea
Unable to walk as their toes are turned inwards
Drooping of wings

Treatment

- Riboflavin @3.6 mg/kg of feed in chicks
- Riboflavin @ 1.8 mg/kg of feed in growers
- Riboflavin @ 2.2mg/kg of feed in layers

Cannibalism and feather picking

Cannibalism is a problem that is particularly associated with large poultry flocks where birds kept in close confinement peck at each other. This can produce significant mortality in the flock when injury results. It will also cause a decrease in egg production as the hen-pecked birds become stressed. Some chickens are more likely to engage in cannibalism than others. The problem has a range of causes, which are heat without adequate ventilation/nests and nesting areas not dark enough /crowding/ high densities of birds/ boredom or lack of exercise /feed and water troughs too few or too close together/external parasites may cause a chicken to pull out its own feathers, and draw blood. This may attract other birds to peck at the area.

Chapter: 17

Prevention (including vaccination schedule) and control of important diseases of livestock and poultry

Vaccination is essential for the dairy animals at regular intervals to protect the animals against the infectious diseases. Vaccination is practice of artificially building up in the animal body immunity against specific infectious diseases by injecting biological agents called vaccines. Vaccination may be used prophylactically to confer protection in anticipation of a disease; but it is never a substitute to good sanitation and hygiene on animal farms. This prevents the spread of diseases. Also, vaccination can be used routinely on animal's farms as an insurance against the possible diseases flare-ups. As vaccination protects the animals against infectious diseases same time deworming protects the animals against helminths/internal parasites. Each and every farmer should keep his herd worm free to maintain animal's production and maximum benefits. Young animals should preferably be dewormed every month using a suitable anthelmintic. Older stock can be dewormed at 4-6 months interval. It is good to deworm the adult females after parturition. All the animals at a farm should be dewormed (oxyclozanide + levamisole) 21 days prior to vaccination. Young animals may be dewormed with albendazole/fenbendazole every month.

VACCINATION SCHEDULES FOR CATTLE AND BUFFALOES

S.no	Name of Disease	Age at first dose	Booster dose	Subsequent dose(s)
1.	Foot and Mouth Disease (FMD)	4 months and above	1 month after first dose	Six monthly
2.	Haemorrhagic Septicaemia (HS)	6 months and above	**-**	Annually in endemic areas.
3.	Black Quarter (BQ)	6 months and above	**-**	Annually in endemic areas
4.	Brucellosis	4-8 months of age	(Only female calves)	Once in a lifetime
5.	Theileriosis	3 months of age and above	**-**	Once in a lifetime. Only required for crossbred and

				exotic cattle
6.	Anthrax	4 months and above	**-**	Annually in endemic areas
7.	IBR	3 months and above	1 month after first dose	Six monthly (vaccine presently not produced in India)
8.	Rabies(Post bite therapy only)	Immediately after suspected bite	4th day	7, 14, 28 and 90 (optional) days after **first** dose.

IMPORTANT POINTS TO BE NOTED DURING VACCINATION

- Animals should be in good health at the time of vaccination.
- The cold chain of the vaccines wherever prescribed should be maintained till the time of
- Proper control and restraining of animals.
- The manufacturers' instruction on the route and dosage should be strictly followed.
- A minimum vaccination coverage of 80% of population is required for proper control of the disease.
- It is beneficial to deworm the animals 2-3 weeks before vaccination is carried out for better immune response.
- Vaccination should be carried out at least a month prior to the likely occurrence of the disease.
- Vaccination of animals in advanced pregnancy may be avoided even though in most cases nothing untoward may happen.

Vaccination schedule for Sheep and Goat

S.No.	**Name of Disease**	**Vaccination shchedule**	
		First vaccination	**Regular Vaccination**
1.	P.P.R. Peste Des Pettis Ruminants	At the 3 months of age for kid or lamb & above	Once in three years
2.	Enterotoxaemia	At the age of 4 month for kid or lamb (If dam is vaccinated) At the age of 1st week for kid or lamb(If dam is not vaccinated)	Before monsoon (Preferably in May). Booster vaccination after 15 days of first vaccination.
3.	Foot & mouth disease (F.M.D.)	At the age of 4 month for kid or lamb & above	Twice in a year (September & March)
4.	C.C.P.P	At the age of 3 month & above for Kid or lamb	Once Annually (January month)
5.	Haemorrhagic Septicemia (H.S.)	At the age of 6 month for kid or lamb	Once Annually Before monsoon
6.	Anthrax	At the age of 6 month for kid or lamb	Once Annually (In Affected area only)

7..	Black Quarter (B.Q)	At the age of 6 month for kid or lamb	Once Annually (Before monsoon)
8.	Goat Pox	At the age of 3 month & above for Kid	Once Annually (December month)

Prevention and control of Poultry diseases

1. Changing litter material should be practiced at regular interval.
2. Maintain clean feeding troughs and waterer at Poultry farm.
3. Young birds should be separated from older birds.
4. Avoid reuse of litter materials.
5. Racking of litter materials can reduce the infections.
6. Treatment of the soil or litter to kill intermediate hosts is useful.
7. Litter may be treated with suitable insecticides.
8. Litter materials should always be kept in dry condition.
9. Extreme care should be taken to ensure that feed and water are not contaminated.
10. Provide clean feed ingredients and drinking water.
11. Regular deworming of chicks with piperazine compounds is highly effective.
12. Poultry runs should be well drained.

General principles for prevention of diseases

- Changing litter material should be practiced at regular interval.
- Maintain clean feeding troughs and waterer at Poultry farm.
- Young birds should be separated from older birds.
- Procure the day old chicks, which are free from diseases from reputed hatcheries
- Feeds must be tested to ensure that they are free from microbial agents or toxins at periodic intervals.
- Storage facilities for feed ingredients/feeds must be managed in a hygienic manner.
- Sheds having infected flocks should be served with feed at the end of a delivery day.
- Always ensure the supply of clean and potable water. If necessary use appropriate sanitizers.
- Periodic inspection of wells, piping and tanks to ensure that water supplied is clean.
- An area specific vaccination schedule as recommended by hatchery doctor must be practised with utmost care.
- Rodent control programme, where ever necessary, must be adopted by employing mechanical (traps) or chemical techniques along with strict sanitation measures.
- After selling each crop from the sheds, thorough cleaning of sheds should be done by removing all fixtures, equipment, litter dust, debris followed by

brooming and burning. The rat holder cracks, worn out area should be packed with cement.

- Avoid use of litter as manure around the farms.
- Well cleaning of sheds and equipment with water and appropriate detergent.
- A thorough disinfection of sheds, equipments as well as farm surroundings by formalin spray at recommended concentration.
- Foot baths should be always filled with disinfectant.
- Vehicles visiting the farms should be thoroughly disinfected by appropriate disinfectant spray.
- Personnel working in laying sectors should not be allowed into brooding/growing sector or feed manufacturing facilities. All visitors must be ensured to walk through foot baths.
- Disposal of dead birds in hygienic manner either by using incinerator or by pit method is very essential.

At the time of an out break

- Restrict the movement of birds (selling and buying)
- Follow strict hygienic measures.
- Take help of Veterinarians.

13.

Vaccination schedule for Broilers

Days	**Vaccine**	**Route**
0 day	Mareks Disease Vaccine (HVT)	0.2ml S/C
1st week	Ranikhet Disease Vaccine- RDVF	O/N
2nd week	Infectious Bronchitis vaccine	O/N
3rd week	Infectious Bursal Disease Vaccine (Gumboro disease)	O/N
4th week	Booster RD La Sota	Water

Vaccination Schedule for Layers Birds

Days	**Vaccine**	**Route**
0 day	Mareks Disease Vaccine (HVT)	S/C 0.2 ml
1 week	Ranikhet Disease Vaccine- RDVF	O/N
2 week	Leechi Disease Vaccine (Optional)	Water

2-3 week	Infectious Bursal Disease Vaccine-Pruning Intermediate Georgia	O/N or water
3-4week	Infectious Bronchitis	O/N or water
4-5week	IB Vaccine Booster	Water
5-6week	RD vaccine Booster- La Sota	Water
6th Week	Fowl Pox Vaccine or Infectious Coryza Vaccine	S/C
8th Week	RD vaccine- RDVK or R2B	S/C or I/m
9th Week	Fowl Pox Vaccine	Wing web
12th-13th Week	IB Booster	Water
18th week	RD Booster- RDVK or R2B	S/C or I/m
45th-50th Week	RD La Sota repeated every once in 2 Months	Water

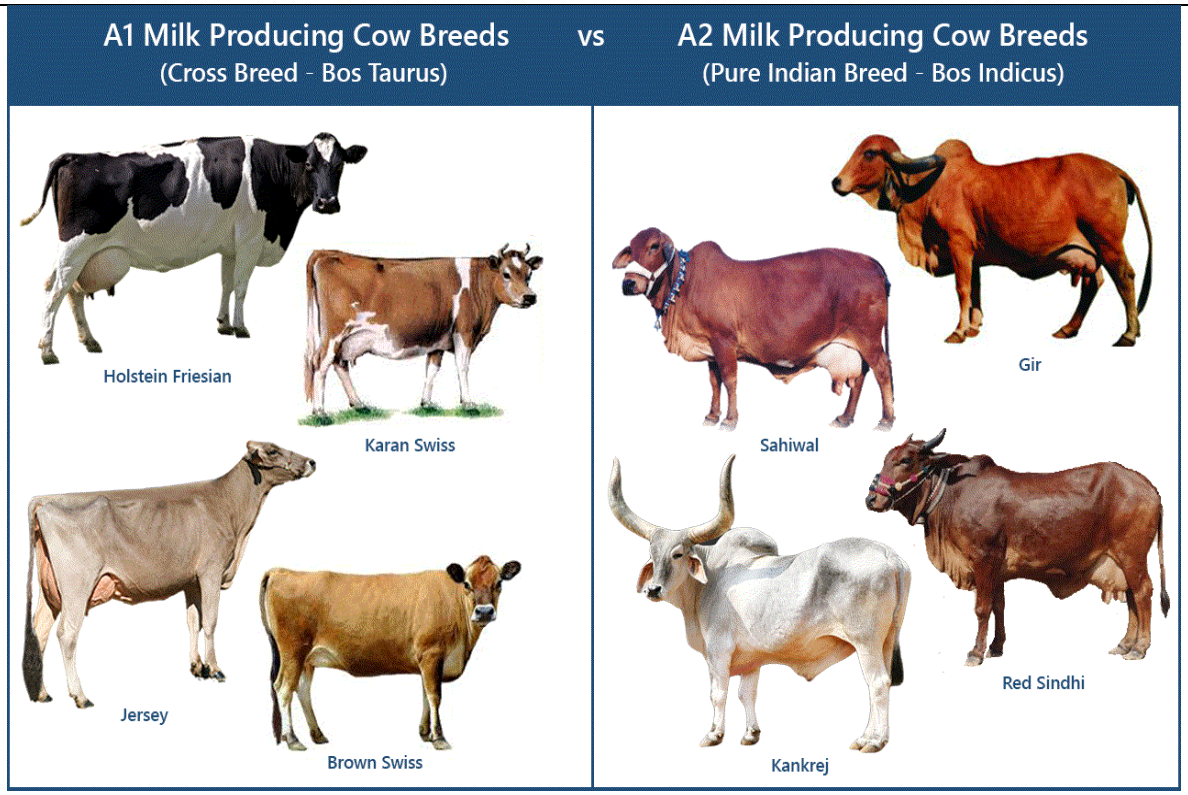
COMMON REASONS FOR VACCINATION FAILURE

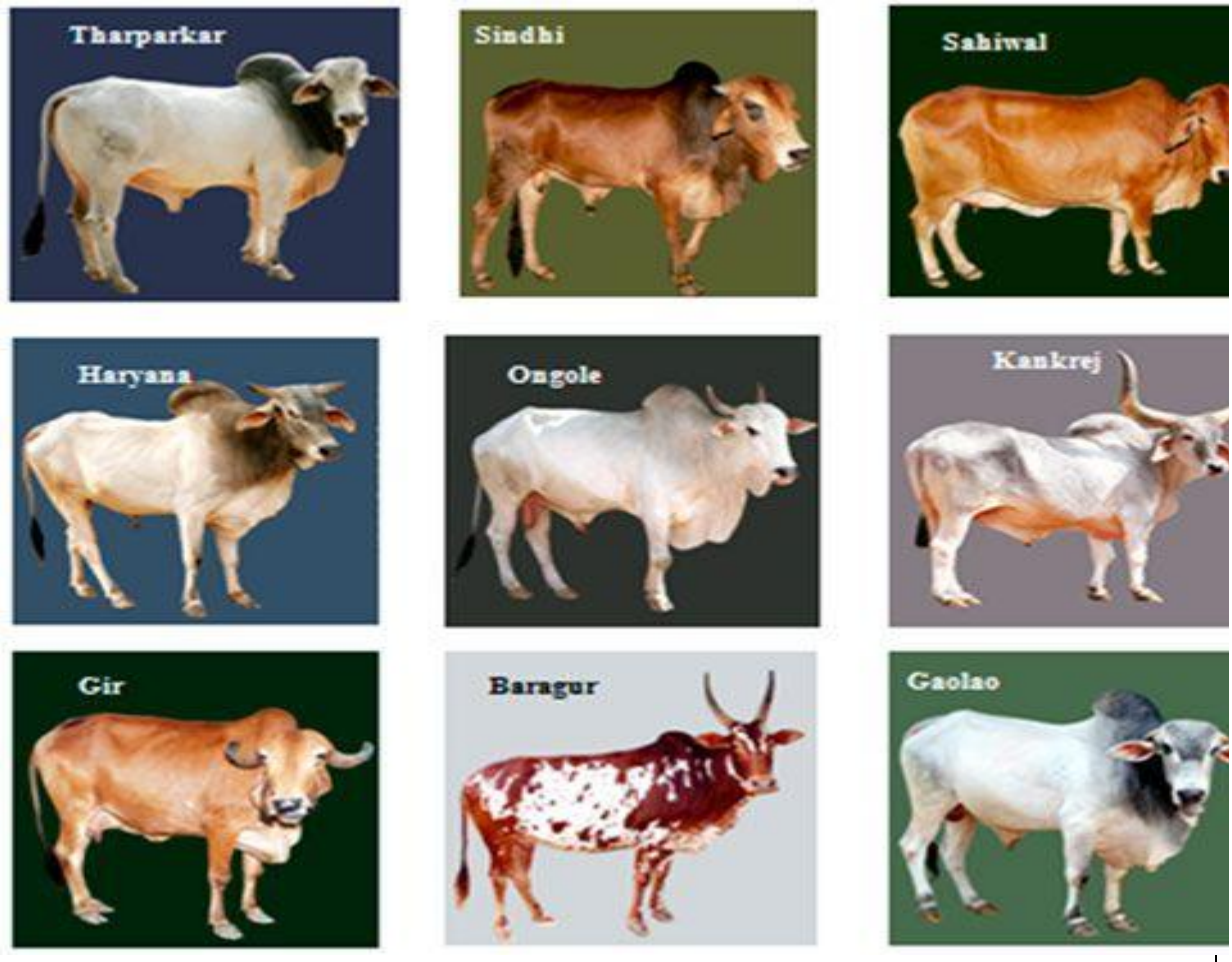
- Lack of maintenance of cold chain from the time of manufacture till vaccination.
- Poor immune response in weak and improperly fed animals.
- Lack of herd immunity due to only a few animals being vaccinated.
- Poor quality of vaccine - Quality will deteriorate if repeatedly thawed and cooled.
- Low efficiency or ineffective vaccine – May occur in case of strain variation (eg. FMD).

Appendix

Appendix (Pictures-Breeds of Livestock)

Breeds of cattle





Breeds of cattle

देवनि गाय

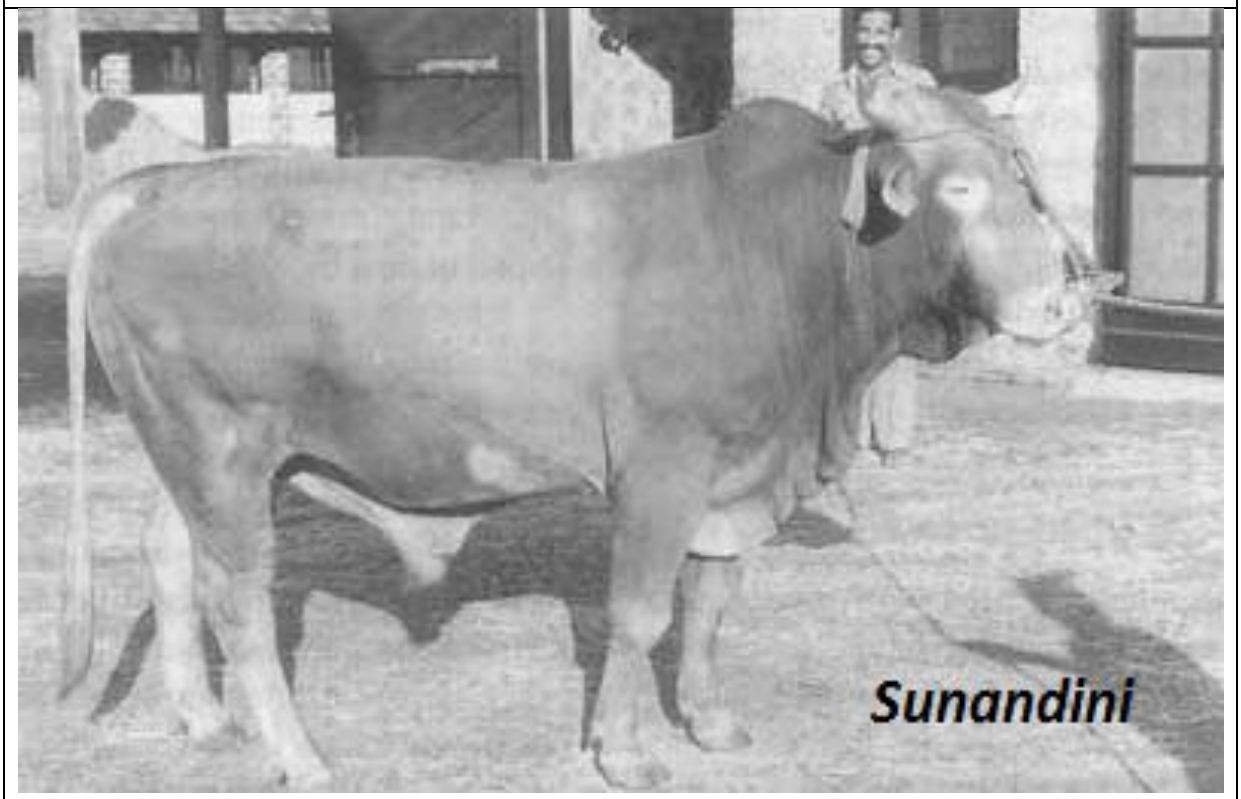
HALLIKAR

Breeds of cattle

UMBLACHERY

Breeds of cattle

Breeds of cattle



Breeds of Buffalo

MURRAH

JAFFRABADI

Murrah

Nagpuri

Surti

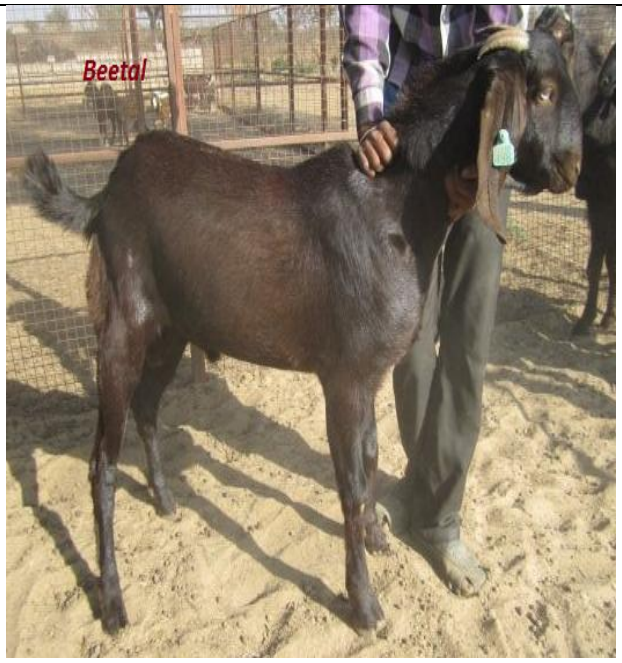
Bhadavari

Mehsana

Jafrabadi

Goat breeds of India

Goat breeds of India

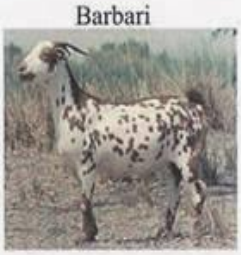


Exotic goat breeds

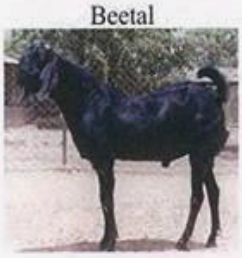
Registered Breeds of Goat in India

Attapady Black

Barbari



Beetal



Berari

Black Bengal

Changthangi

Chegu

Gaddi

Ganjam

Gohilwadi

Jakhrana

Jamunapari

Kanni-adu

Konkan-Kanyal

Kutchi

Malabari

Marwari

Mehsana

Osmanabadi

Sangamneri

Sirohi

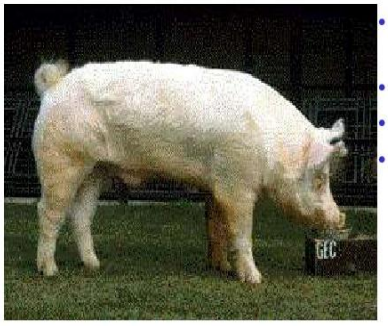
Surti

Zalawadi


भेड़ की भारतीय नस्लें
SHEEP BREEDS OF INDIA
राष्ट्रीय पशु आनुवंशिक संसाधन ब्यूरो
पोस्ट बाक्स नं. 129, करनाल - 132001 (हरियाणा) भारत
National Bureau of Animal Genetic Resources
G.T. Road, Bypass, P.O. Box-129, Karnal - 132001 (Haryana), INDIA
Website : www.nbagr.ernet.in

Swine Breeds

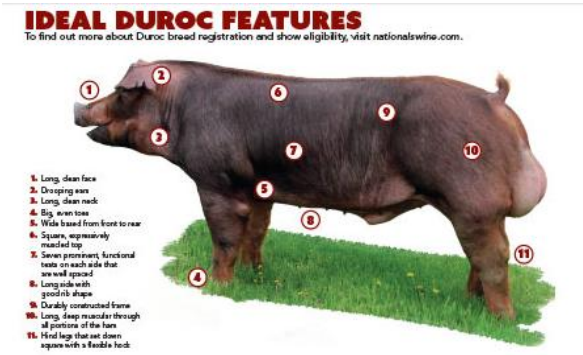
Yorkshire



- Origin- England
- Ears-Erect
- Color- White
- Misc.-The Mother Breed, Largest Litters

Berkshire

- Origin- England
- Ears-Erect
- Color-Black with 6 White Points
- Misc.-Short Snout, Meat type hog



Hampshire

- Origin- Kentucky
- Ears-Erect
- Color-Black with a White Belt
- Misc.-The "Meat Breed" Excellent Carcass

PoultryBreeds

Indegenous Poultry Breeds

ASEEL	KADAKNATH
	
NACKED NECK	NICOBARIN